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ALTERNATIVE FUTURES FOR ENVIRONMENTAL POLICY PLANNING: 1975-2000

STANFORD RESEARCH INSTITUTE

PREPARED FOR
ENVIRONMENTAL PROTECTION AGENCY

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OVERVIEW OF WORKING PAPERS

This volume contains the informal papers used in preparation of the final report, Alternative Futures for Environmental Policy Planning: 1975-2000. This report was prepared by the Center for the Study of Social Policy, Stanford Research Institute, for the Environmental Protection Agency (Office of Pesticide Programs). These working papers are provided for use by the client in its development of a futures planning capability. These are not part of the formal report and are solely intended for use as informal documents to supplement the final report.

This volume consists of three major sections:

Section I: An extended discussion of the alternative futures methodology which was described only briefly in the final report.

Section II: A review of key trend areas which were critical in developing a plausible range of alternative futures scenarios (a summary of each of these is presented in the final report).

Section III: A review of selected futures literature which provided a multi-dimensional source of competing perspectives which, in turn, aided us in putting some "flesh" on the skeletal futures that were developed.

A more thorough discussion of the use of both trend overviews and the futures literature may be found in the extended discussion of the alternative futures methodology. To facilitate access to these papers, a table of contents is presented on the following page.

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SECTION I

ALTERNATIVE FUTURES METHODOLOGY

Introduction

Described below is the futures research methodology developed and applied in this study. Two principal reasons for presenting an extended discussion of methodology are: (1) to provide guidance to the Environmental Protection Agency in applying the methods, and (2) to provide sufficient detail to allow critique and comment by our professional colleagues. To meet these two needs this paper discusses:

- The philosophy and assumptions used
- Selection of the methodology
- Step-by-step details of the methodology
- Advantages and disadvantages of the methodology.

Philosophy and Assumptions

Philosophy

To understand the rationale underlying this project, it is helpful to note that the objective was to provide the Environmental Protection Agency with guidance for future pesticide policy development by:

(1) Defining and forecasting the trends most relevant to determining the shape of alternative Environmental Protection Agency policymaking environments.

(2) Defining and clarifying a range of broad alternative futures that would be directly relevant to pesticide programs.

(3) Presenting an initial analysis of the potential constraints and opportunities affecting the policymaking environment.

An important criterion used in developing the research methodology and alternative futures scenarios was its usefulness to the Environmental Protection Agency's policymaking process.

In policy research, the primary purpose of studying the future is to reduce uncertainty in making decisions. A truly successful technique is one that will maximize certainty in understanding the future. However, projections of the future are always uncertain to some degree because they are based on a limited understanding of the rate and pattern of social change. Although social science has made great strides in the past decades, it has not yet reached the point of being able to explicate the tremendously complex network of causal relationships that determine societal behavior in a known present, let alone in the future. Thus, it is not possible at present to construct a predictive model of society that is comprehensive, rigorous, and highly accurate.[1] A further factor, the rate of social change, must be considered carefully in developing projections of the future. Relationships among the many societal parameters are constantly changing--at times incrementally and at times with quantum departures from prior patterns of change. New and powerful technologies, potent political and cultural movements, changing values and attitudes are some of the dimensions of change whose unevenness--considered both in isolation and related to other forces for change--makes it difficult to predict future society.

Although, futures studies must be conducted with due recognition of the complexities and great uncertainties involved, this is not to say that there is no value to studying the future. Since decisions that have profound effects on the future must be made either with or without study of the future, study properly undertaken can only enhance the quality of the decisions.

Assumptions

We approached the futures problem in much the same spirit--illuminating uncertainty rather than spotlighting certainty--that Donald N. Michael suggests in On Learning to Plan and Planning to Learn.[2] Since we assumed that there is not now any macro theory of social change that has great

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predictive power, the best we could do was to explore a range of future alternatives and to learn from them. The field of vision defined by the alternative futures scenarios will foster decisions responsive to future needs.

We believe that futures research must include not only data-based and analytical inputs, but also imaginative and intuitive inputs. Too strict a reliance on empirical aspects diminishes the largely intuitive pattern recognition aspect; consequently, the future will, with greater likelihood, be filled with shocking surprises for which we are unprepared. Thus, in this research we divided our efforts between analytical and pattern recognition modes of analysis and synthesis.

One further assumption guided our research. None of the scenarios was based on "wild card" events such as magical technological breakthroughs, wars, or natural disasters (other than climatic changes). This is not to say that we do not believe such events will occur, for they most assuredly will, but rather that the number of such potentially perturbing events is limited only by the limits of imagination. We did consider developments that, although highly plausible, are not predictive. For example, we assumed that, given sufficient national motivations and resources, the development of new energy technologies capable of meeting the goals of Project Independence was possible.

Selection of the Methodology

Approaches Considered

In selecting our methodology, we considered a number of different approaches that have been developed to meet problems similar to those encountered in this study. The methods we considered were:

- Extrapolation--This method rests on the assumption that some trends advance in relatively predictable patterns (e.g., exponential, straightline, Pearl curve). Therefore, coupled with historical data and knowledge of constraints and boundary

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conditions, future values can be extrapolated.[3] Trend extrapolation is still the most widely used forecasting method because of its simplicity of implementation and the clarity of its results. However, in an era of multi-dimensional and rapid change it is, on the whole, a naive approach. The forces that sustained a trend in the past may be quite different in the future, especially when the time horizon is more than a few years distant.

- Analogy--In this method the forecast is based on the pattern revealed by an historical event whose nature is considered similar to the event to be forecast.[4] For example, the replacement of jet engines for propeller-driven engines in commercial aviation seems to have followed a pattern very similar to that of the replacement of steam propulsion for sails in ships. Analogy is a relatively simple and straightforward method. The problem lies in adequately defining the critical parameters surrounding both the earlier event and the event to be forecast. If one or more of these critical parameters change significantly, the forecast will be of dubious accuracy.

- Consensus--Bringing together the collective best judgment of a group of experts is widely used today in the format known as "Delphi," developed by Helmar and Dalkey.[5] Anonymity of the experts and multiple iterations to produce consensus are its chief characteristics. Although useful forecasts dealing with relevant trends can be produced, the Delphi method may be time consuming and costly. Difficulties are encountered in selecting the right panel of experts and in the proper framing of questions. The practice of including answers from all panel members, even when a question is outside their field, may produce substantial disparities in the answers, even after two or three iterations. Averaging such answers may produce a statistical consensus without much significance.

- Cross-impact analysis--A series of trends and/or events are interrelated through an array that illustrates the following effects:

  -Reinforcement (of the likelihood or magnitude or proximity) of one trend or event by another
  -Inhibition of one trend or event by another
  -No significant relationship.

  All possible combinations of trends and events are derived (through a Monte Carlo simulation), and the frequency of occurrence of different outcomes is interpreted as a quantitative measure of their likelihood. The importance of each trend or event for the matter under study can be ranked subjectively and, by combining this information with ratings of the degree of

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controllability by the sponsoring agency, ratings of the importance and independence of each trend or event can be derived.[6] This method, in combination with Delphi forecasts, has some current popularity in forecasting the timing of key events and trends. However, to develop adequately and to compare all combinations of trends and events is usually a sizable undertaking, with many null or unimportant cells, and interpretation of the results is arduous and difficult to explain to decision makers. The numerical nature of the output may be deceptively explicit, considering its subjective derivation.

- Morphological Approaches--Several techniques fit under this rubric, such as Field Anamoly Relaxation (FAR)[7] (developed for SRI by R.F. Rhyne of Johnson Research Associates) and Divergence Mapping (developed by Pacific House). These techniques differ from other methods in that they usually deal with whole systems rather than with individual trends or events. Common to these methods are attempts to identify all the significant elements of a system and their potential modes.[8] In addition, there must be some technique for selecting modes of elements and arraying them in some form of scenario. These methods are generally subjective, and their results are seldom quantifiable. Their power lies in their ability to provide rich descriptions of a variety of alternative possibilities.

- Simulation models--Simulation, which also relies on a morphological structure, attempts to specify mathematically the interactions of the elements of the system. It is thus possible to vary the nature of the elements (e.g., test new policies) and observe the resultant behavior of the system. Also, because the model is precisely specified, it is possible to replicate the results for verification.[9] The results of such simulations can be only as good as the ability of the modeler to specify the causal relationships and the initial values to be applied. Thus, because a number of significant elements, particularly political and social elements, are nonquantifiable, they are usually dropped from consideration. Furthermore, construction of such models is time consuming and costly.

Problems Confronted

As we reviewed the above approaches in the light of the objective of this research, we recognized the need to minimize four deficiencies: bias, lack of rigor, lack of comprehensiveness, and nonquantifiable results.

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Bias

Throughout the research a number of judgments had to be made on matters such as: Which trends are important? What are their significant interrelationships? Who are the relevant participants? Because development of alternative futures is more an art than a science, bias in making judgments is inevitable. This is especially true if one relies solely on a single methodology or approach. If quantified data are sought, there is bias of indeterminable amount in selecting trends for which quantifiable data are easily accessible. If the trend or issue centers on cultural and subcultural belief systems, there may be substantial bias in its interpretation, given the belief set of the researcher. For example, the methodology may be biased by an implicit image of man: Is he viewed as free and rational, or as unfree and pushed about by his drives, habits, and social roles? It may be biased by a Malthusian pessimism or a technocratic optimism. We attempted to minimize such bias by deliberately employing several diverse approaches which would allow us to illuminate our hidden assumptions as well as inject fresh perspectives from external sources.

Lack of Rigor

None of the available methodologies are rigorous in a truly scientific sense. One test regularly applied to a method is whether it can successfully encompass historical data. However, meeting that test suggests little about the future-oriented success of the technique. In an era of rapid change those historical causal relationships that were accounted for may change dramatically and discontinuously.

There are only two immediate remedies for this lack of rigor. One is the obligation of the researcher to make his assumptions explicit to the fullest extent possible, and the second is for the user of the research to approach the results in a skeptical and critical frame of mind.

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Comprehensiveness

The number of trends that could have been studied in this research is much larger than those we actually studied. Inevitably, some will feel that important factors have been given insufficient attention. One can only ameliorate this problem by bringing to bear the best judgment of people representing a variety of points of view.

Nonquantifiable Results

Although it is possible to arrive at quantifiable probability and reliability estimates for forecasts, such numbers begin to loose any real meaning the farther into the future one's vision is projected. Further, while quantitative measures may be generated in some cases, in a number of important instances significant trends and events will be largely nonquantifiable.

The Approach Selected

As we began the design of our methodology, we recognized the need for a composite approach that would combine the strengths of various methods and compensate for their weaknesses. Each staff member involved in this phase of the study had a unique point of view regarding the best approach. One wanted a more imagistic, pattern recognition approach; another wanted a more data-based, rigorous method; one wanted to rely more on the lessons of history; and so on. The approach that finally evolved was not entirely satisfactory to any. However, after using the methodology each staff member came to appreciate the utility of this multi-faceted approach. We would be less than candid if we claimed that this interdisciplinary process evolved entirely by design; it did not. The process was a composite of rational method mixed with serendipitous muddling through.

An additional requirement in selecting our methodology was that it should lend itself to ongoing monitoring. The scenarios had to be constructed in such a way that the Environmental Protection Agency could assess the likelihood of their emergence by monitoring certain trends over time, eliminating projections that are not realized, and focusing on those that remain plausible.

In general, the methodology developed was applied in four stages:

(1) Trend analysis
(2) Development of skeletal futures
(3) Review of futures literature
(4) Expansion of skeletal futures

These four stages are described in the following section.

Details of the Selected Methodology

We present here the step-by-step details of our approach. It is important to note that in most cases where important substantive decisions were made, they were made jointly with the Environmental Protection Agency staff.

Stage I: Trend Analysis

The purpose of this stage was to provide an overview of trends that are shaping the future and to focus attention on a workable but significant subset of the larger trends universe. We began by developing an extended list of relevant trends. As we reviewed this trend universe, we worked toward identifying trend clusters that would best capture and describe the major elements of societal change. To our trend list the Environmental Protection Agency added several areas of particular interest. A series of trend papers were developed to give the project team an overview of a wide range of important trends. These trend areas were:

Climate
The demand for food and fibers
The supply of food and fiber and the demand for pest control
Energy
Ecological implications of pesticides

World societal trends--1975-2000
Trend projection for international conflict--1975-2000
Agricultural foreign aid policy
Comments on the outlook for cancer in society
Trends in ways of life

We did not review all potentially relevant trends. Limited funds and time made it necessary to constrain the trend set. Further, the need to provide a study focus required that limits be placed on the trends universe. Finally, choices of trends were also governed by the ultimate use of the study: guidance for environmental policy planning. Thus, topics like education, politics, and technological innovation (except in energy and agriculture), although of interest in any attempt to describe alternative futures holistically, were not specifically reviewed in the trend portion of the study.

We next proceeded to an even finer screening to identify the smallest set of trends that would uniquely describe an alternative future. Our rationale was that the general shape of the future (determined by the interaction of a large number of variables) could, in great measure, be described by the behavior of a much smaller set of variables. Thus, the smallest trend set possible was derived in order to make the alternative futures generation process manageable--particularly since the relationships among the trends were not quantified. We studied each of our trend areas to determine the degree to which the general shape of the future was sensitive to alternative directions of that trend. This analysis resulted in the selection of a subset of four trend areas: energy, climate, food, and values. We called these "driving" trends because their outcomes would substantially drive or determine the shape of the future. For each trend area the alternative directions had to be defined. These directions and definitions are shown in Table 1.

Table 1

ALTERNATIVE DIRECTIONS OF DRIVING TRENDS

Alternative Directions	Definition
Energy (E)	
E_1 = Continued high growth	The historical trend of high growth (rate=4%) in energy consumption in continued.
E_2 = Controlled growth	The growth rate in energy consumption is controlled by design and slowed (rate=1 to 3%).
E_3 = Unsuccessful high growth	The continued high growth in energy consumption is disrupted by severe supply problems and a rapid net decline is experienced.
E_4 = Zero or declining growth	The growth rate in energy consumption is leveled out (rate=0 to 1%).
Climate (C)	
C_1 = Variable climate	From year to year the climate is relatively unpredictable, swinging from good to bad. In some years the weather conditions for agriculture are generally favorable; in others drought, untimely rain, or shortened growing seasons are experienced.
C_2 = Improving/constant climate	The trend from 1890 to 1960 of generally good and predictable weather is resumed. From year to year the weather pattern aids expanding agricultural production.
C_3 = Worsening climate	The trend from 1960 to 1970 of cooler weather and shifting, hence unpredictable weather, is continued. In most years droughts, untimely rain, shortened growing season, or other weather-related calamity is common.
Food (F)	
F_1 = High prices for food/no food shortage	A number of forces can combine to create a high price without a food shortage; e.g., higher energy prices, a moderate degree of adverse climatological change, export of food to enhance balance of payments, more food demanded because of population growth domestically and/or abroad, greater proportion of indirect consumption of protein, greater proportion of food consumed with technological input (so-called "convenience foods"), and so on.
F_2 = Moderate food price/no shortage	This condition assumes that the supply and demand factors discussed above do not individually or collectively conspire to create high prices and/or shortages.
F_3 = High food price/food shortage	This assumes that some combination of adverse circumstances, domestic and/or international, creates a condition where there are both high food prices and chronic food shortages.

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Table 1 (Continued)

Alternative Directions	Definition
Values (V)	
V_1 = Achievement values	This sector of the population emphasizes material things--status, fame, affluence, and outward achievement-- on the personal level, and growth, bigness, competition--on the system level. Other descriptors or values congruent with this sector include: mechanistic, materialistic, individualistic, secular, centralized, scientistic, empirical.
V_2 = Survival values	This sector embraces the values of the achievement sector as described above; however, the material circumstances are such that these values cannot be readily realized. The consequences are frustration, dogged endurance, emphasis upon security and survival aspects of achievement values and so on.
V_3 = Frugal values	Emphasis in this group is on voluntary simplification of the exterior aspects of life in order to attain greater richness of inner aspects. Coupled with the foregoing are two other dominant values: a self-realization ethic that asserts that each person's proper goal is the evolutionary development of his fullest human potential; and an ecological ethic that asserts that the Earth is limited, recognizes the underlying unity of the human race, and perceives man as an integral part of the natural environment.
V_4 = Survival/frugal split	This values pattern emerges when the dominant achievement sector is substantially reduced to a small minority by adverse economic circumstances and leaves two divergent modes of responding. The nature of the response of these two groups is often nearly identical, but the motivation (premised on values) is often quite different; e.g., survival folks consume less gasoline because of the high price and frugal folks consume less because of the high price and because they wanted to consume less, given their values orientation.
V_5 = Trimodal split (achievement, survival, frugal)	This values group assumes that there is no single dominant values sector in society; the values are split among the three groups.
V_6 = Achievement/frugal split	The values are split predominantly among the two groups along the values dimensions characterized above for each.
V_7 = Achievement/survival split	The values are split predominantly between these two groups along the dimensions described above.

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Stage II: Development of Skeletal Futures

In this stage the skeletal structure of each of the ten scenarios was developed by defining the most plausible and usefully diverse interactions of the four driving trends over time.* As an example of an interaction, consider the situation in which adverse climatological changes (C_3) and chronic energy shortages (E_3) create a situation of high food prices and short food supply (F_3), and all three factors converge to motivate a substantial value change toward a more frugal life style (V_4). The first step in this process was to identify all the possible sets of such interactions (E_i, C_j, F_k, V_l) for each of the points in time of 1980, 1990, and 2000. Since the overall time frame of the study had been determined by the Environmental Protection Agency as the next twenty-five years, the end point of the year 2000 was automatic. The selection of 1980 and 1990 as intervening points was somewhat arbitrary. For policy purposes the process of evolution to the year 200 is as important as the end state. Our experience in earlier work shows that two midpoints usually provide a clearer sense of the transition dynamics.

The process of skeletal scenario generation is similar to the Field Anomaly Relaxation Method (FAR) developed by Russell Rhyne. Each E_i

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*A brief remark on the world context is appropriate here. In our trend analysis we studied alternative world futures at a national and regional level (see papers on World Societal Trends and Potential for International Conflict). This analysis led us to conclude that for the purposes of this study two different patterns were of primary relevance. One pattern foresees a relatively stable, economically progressive, and calm world context in the future; the other world context is not unlike recent history: politically and economically turbulent, and, from time to time, militarily precarious. As we developed the scenario skeletons, we analyzed each scenario to identify its sensitivity to these two patterns.

was tested against each C_j for the year 1980 to identify directions that could reasonably coexist. Each E_iC_j pair that survived was then tested against each F_k for 1980 and then for each V_l. This process resulted in 5 varied sets of E_i,C_j,F_k,V_l for 1980. The process was then repeated for the years 1990 and 2000, resulting in 8 additional sets for 1990 and 3 more for 2000. All 17 sets are shown in Table 2: the number of sets increases with time in response to the assumption that the near term is more constrained than the long term. Of course, the sets available for 1990 include those for 1980, and sets for 2000 include those for 1990.

The next step required the definition of plausible transitions from a set (E_i,C_j,F_k,V_l) in 1980 to another set (E_i,C_j,F_k,V_l) in the year 1990. In this exercise the unpredictability of the climate variable was particularly important. We therefore had to consider all the possibilities in each time period.

We began by reducing the number of sets for 1980 from five to three to make the process more manageable. The sets $E_1C_1F_1V_1$ and $E_2C_2F_1V_6$ were considered less likely to occur than the others. In the latter set, for example, the emergence of an achievement-frugal value split (V_6) within 5 years, although plausible, was deemed less probable than the other options; however, that same set was considered entirely possible by 1990. For the 3 sets we used for 1980, we attempted to construct a plausible path to each of the sets for 1990. For example, the set $E_1C_3F_1V_5$ could become $E_1C_2F_2V_6$ in 10 years if the climate improved and if new energy technologies and sources were developed. We then identified different plausible paths from the sets in 1980 to the sets in 1990. These are shown in Figures 1A and 1B.

Once again we had to reduce the number considered, because the number of plausible paths to the year 2000 would still have been in the thousands. In selecting the sets to include for 1990, we considered both the transition dynamics and the state descriptions. A primary concern was that a wide spectrum of possibilities should be considered.

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Table 2

SELF-CONSISTENT DRIVING TREND INTERACTIONS, BY TIME PERIOD

1980

1. $E_1C_1F_1V_1$
2. $E_1C_2F_2V_1$
3. $E_1C_3F_1V_5$
4. $E_2C_1F_1V_5$
5. $E_2C_2F_1V_6$

1990

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6. $E_1C_2F_2V_6$

7. $E_1C_3F_3V_4$

8. $E_2C_1F_3V_4$

9. $E_2C_3F_3V_5$

10. $E_3C_1F_3V_7$

11. $E_3C_2F_3V_7$

12. $E_3C_3F_3V_2$

13. $E_3C_3F_3V_4$

14. $E_4C_2F_2V_3$

2000

1\.

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15. $E_1C_3F_1V_1$

16. $E_2C_2F_1V_1$

17. $E_4C_1F_1V_3$

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Figure 1-A

PLAUSIBLE TREND CLUSTERS AND TRANSITIONS: 1980-1990
(assuming variable climate, C_1, in 1990)

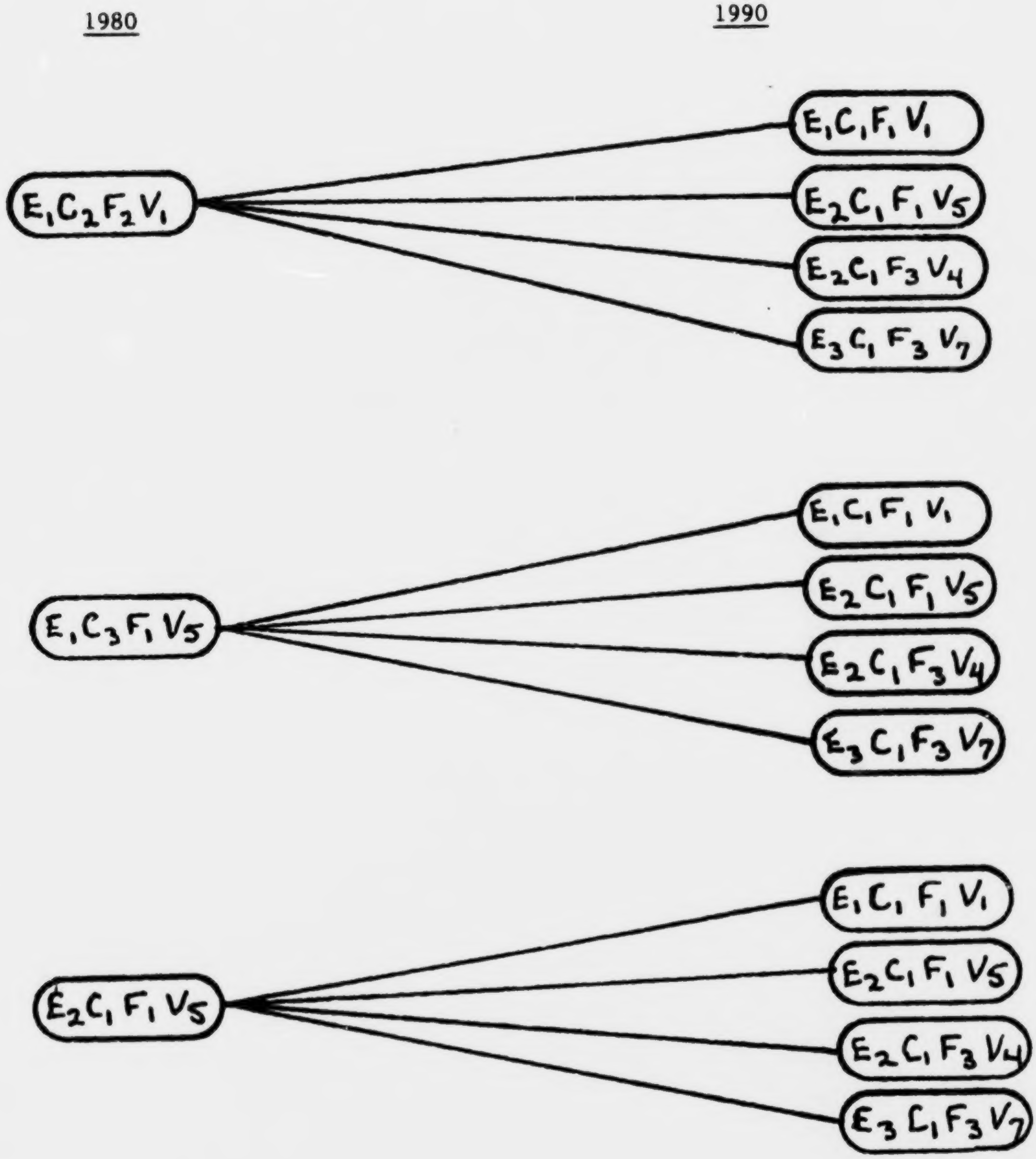
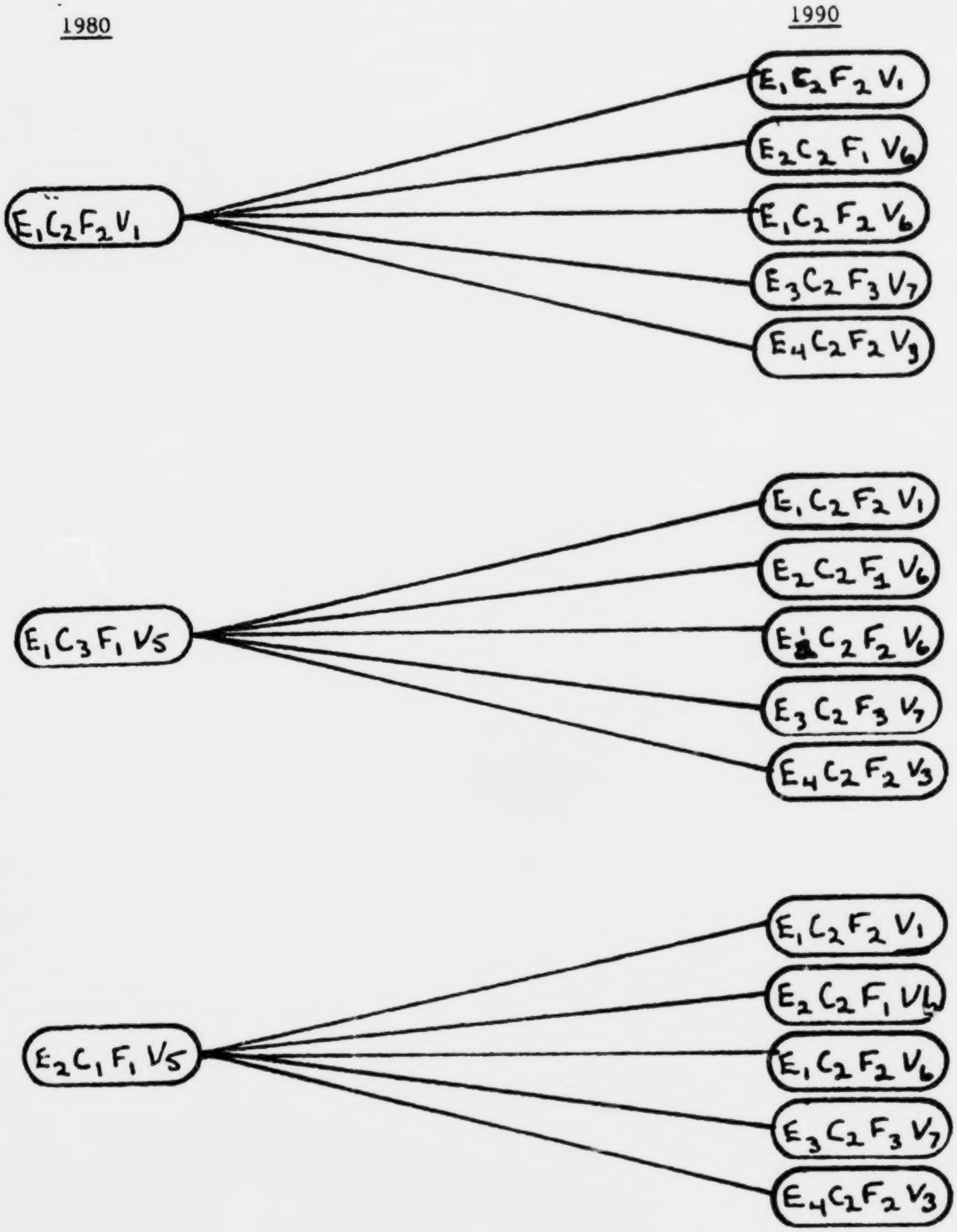

1980
1990
$E_1C_2F_2V_1$
$E_1C_1F_1V_1$
$E_2C_1F_1V_5$
$E_2C_1F_3V_4$
$E_3C_1F_3V_7$
$E_1C_3F_1V_5$
$E_1C_1F_1V_1$
$E_2C_1F_1V_5$
$E_2C_1F_3V_4$
$E_3C_1F_3V_7$
$E_2C_1F_1V_5$
$E_1C_1F_1V_1$
$E_2C_1F_1V_5$
$E_2C_1F_3V_4$
$E_3C_1F_3V_7$

Figure 1-A (continued)

PLAUSIBLE TREND CLUSTERS AND TRANSITIONS: 1980-1990
(assuming improving climate, C_2, in 1990)


1980
1990
$E_1C_2F_2V_1$
$E_1E_2F_2V_1$
$E_2C_2F_1V_6$
$E_1C_2F_2V_6$
$E_3C_2F_3V_7$
$E_4C_2F_2V_3$
$E_1C_3F_1V_5$
$E_1C_2F_2V_1$
$E_2C_2F_1V_6$
$E_1C_2F_2V_6$
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$E_2C_1F_1V_5$
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$E_2C_2F_1V_6$
$E_1C_2F_2V_6$
$E_3C_2F_3V_7$
$E_4C_2F_2V_3$

Figure 1-A (continued)

PLAUSIBLE TREND CLUSTERS AND TRANSITIONS: 1980-1990
(assuming worsening climate, C_3, in 1990)

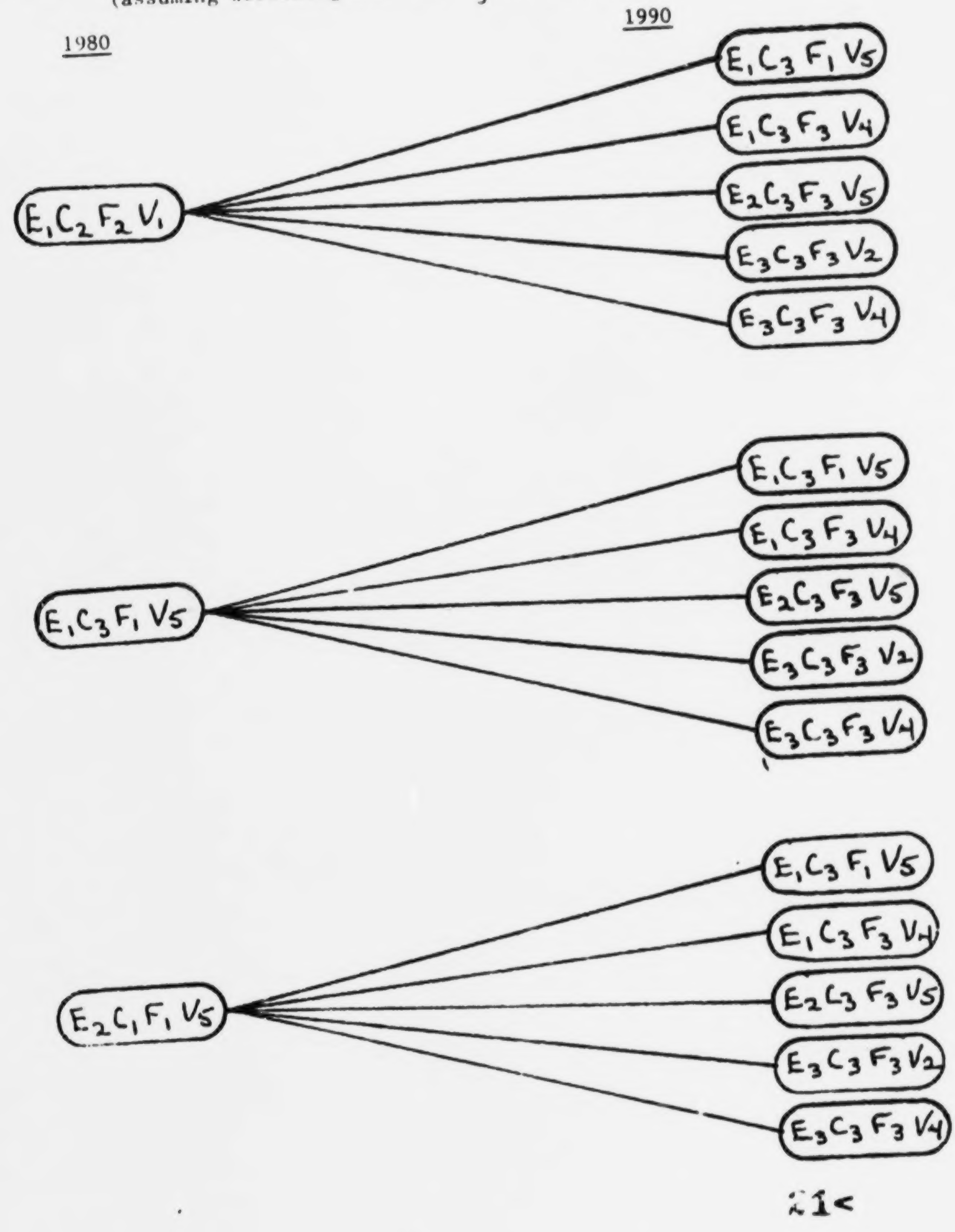

1980
1990
$E_1C_2F_2V_1$
$E_1C_3F_1V_5$
$E_1C_3F_3V_4$
$E_2C_3F_3V_5$
$E_3C_3F_3V_2$
$E_3C_3F_3V_4$
$E_1C_3F_1V_5$
$E_1C_3F_1V_5$
$E_1C_3F_3V_4$
$E_2C_3F_3V_5$
$E_3C_3F_3V_2$
$E_3C_3F_3V_4$
$E_2C_1F_1V_5$
$E_1C_3F_1V_5$
$E_1C_3F_3V_4$
$E_2C_3F_3V_5$
$E_3C_3F_3V_2$
$E_3C_3F_3V_4$

Figure 1-B

PLAUSIBLE TREND CLUSTERS AND TRANSITIONS: 1990-2000
(assuming variable climate, C_1, in 2000)

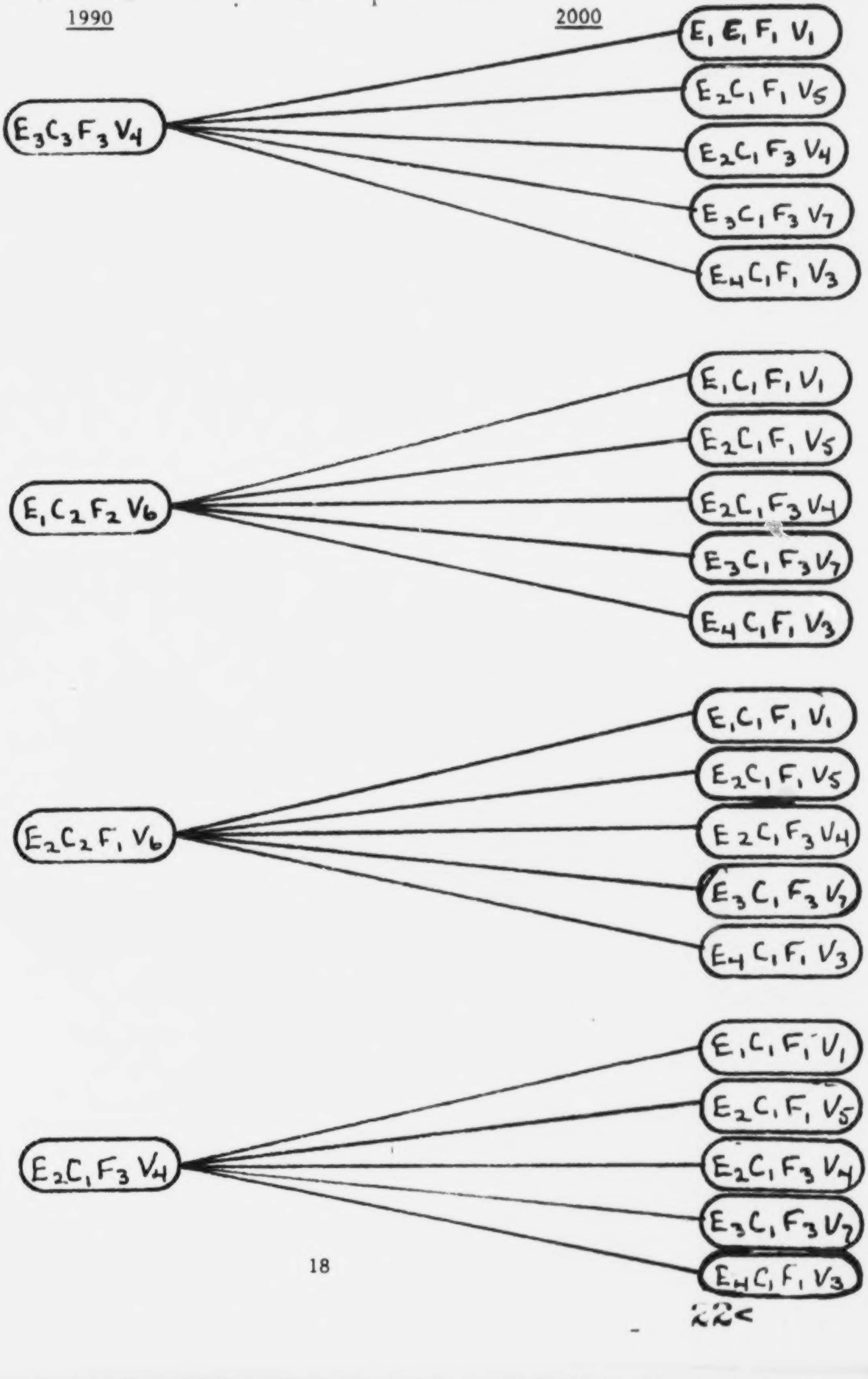
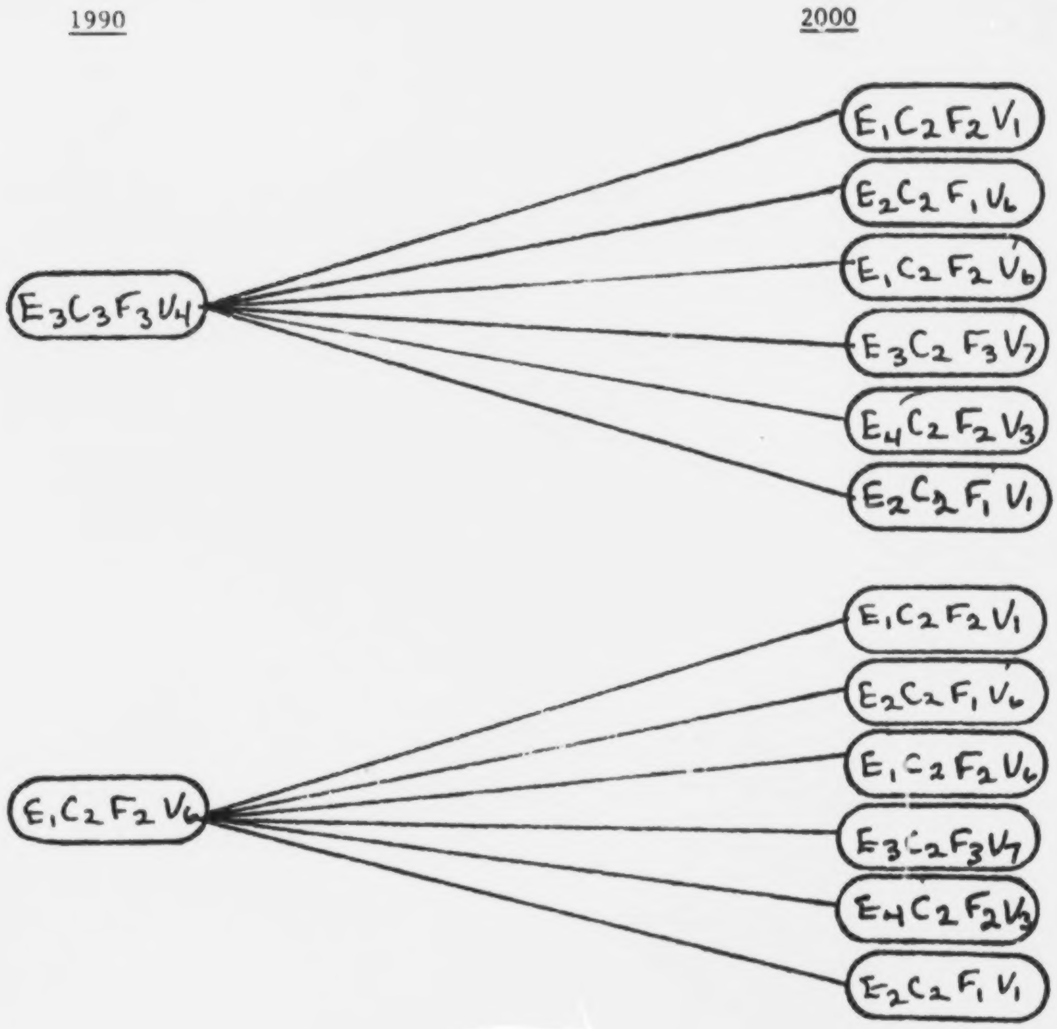

1990
2000
$E_3 C_3 F_3 V_4$
$E_1 C_2 F_2 V_6$
$E_2 C_2 F_1 V_6$
$E_2 C_1 F_3 V_4$
$E_1 E_1 F_1 V_1$
$E_1 C_1 F_1 V_1$
$E_2 C_1 F_1 V_5$
$E_2 C_1 F_3 V_4$
$E_3 C_1 F_3 V_7$
$E_4 C_1 F_1 V_3$

Figure 1-B (continued)

PLAUSIBLE TREND CLUSTERS AND TRANSITIONS: 1990-2000
(assuming improving climate, C_2, in 2000)


1990
2000
$E_3C_3F_3V_4$
$E_1C_2F_2V_1$
$E_2C_2F_1V_6$
$E_1C_2F_2V_6$
$E_3C_2F_3V_7$
$E_4C_2F_2V_3$
$E_2C_2F_1V_1$
$E_1C_2F_2V_6$
$E_1C_2F_2V_1$
$E_2C_2F_1V_6$
$E_1C_2F_2V_6$
$E_3C_2F_3V_7$
$E_4C_2F_2V_3$
$E_2C_2F_1V_1$

(continued on the next page)

Figure 1-B (continued)

PLAUSIBLE TREND CLUSTERS AND TRANSITIONS: 1990-2000
(assuming improving climate, C_2, in 2000)

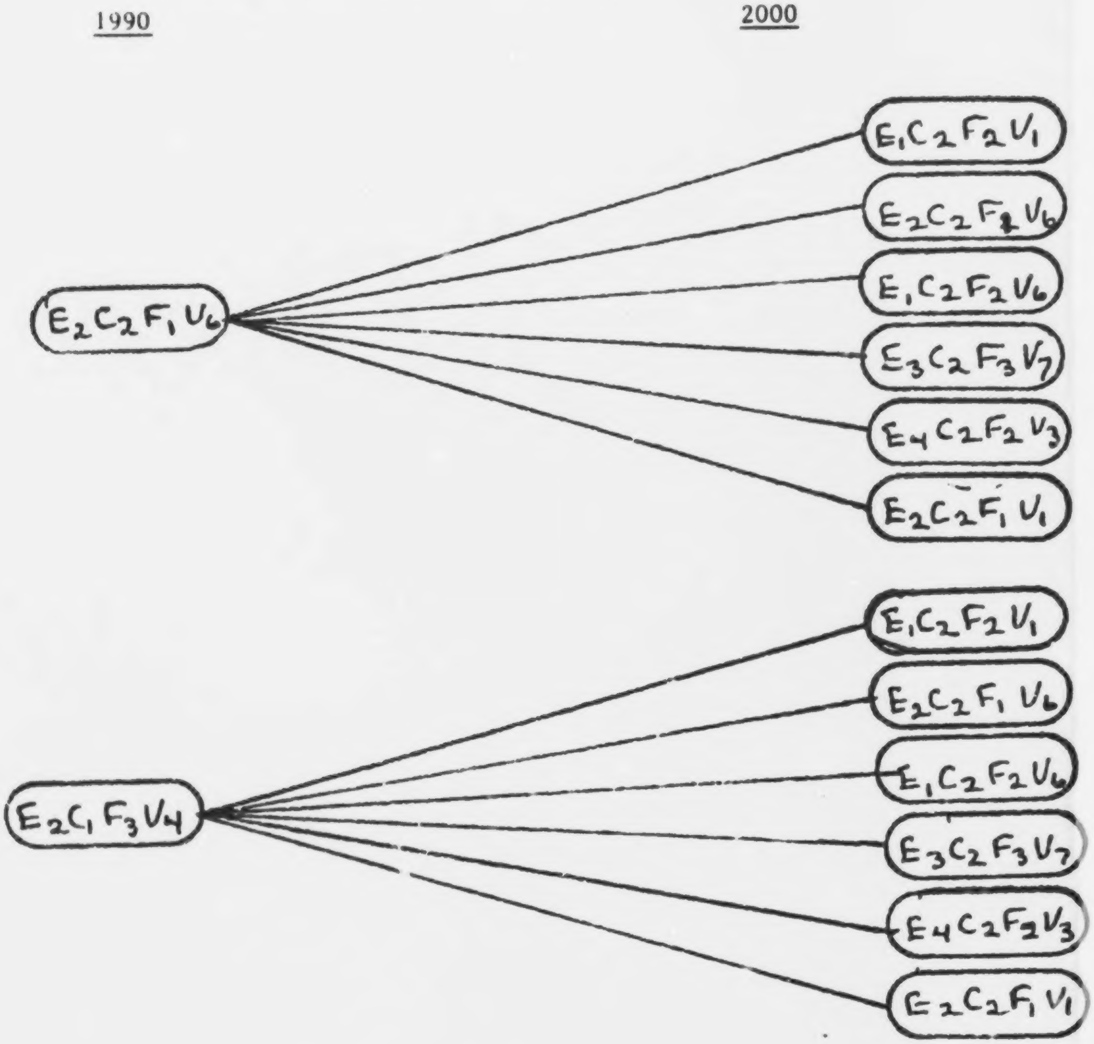
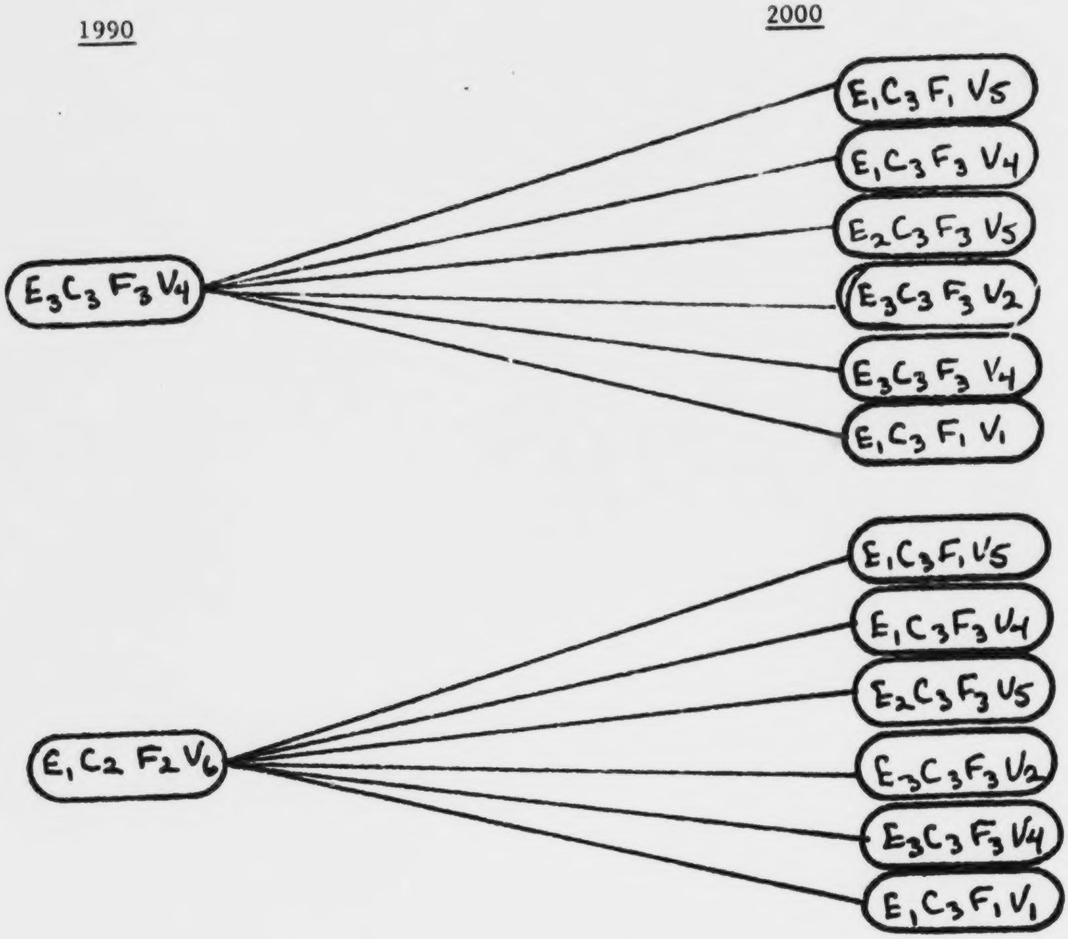

1990
2000
$E_2C_2F_1V_6$
$E_1C_2F_2V_1$
$E_2C_2F_1V_6$
$E_1C_2F_2V_6$
$E_3C_2F_3V_7$
$E_4C_2F_2V_3$
$E_2C_2F_1V_1$
$E_2C_1F_3V_4$
$E_1C_2F_2V_1$
$E_2C_2F_1V_6$
$E_1C_2F_2V_6$
$E_3C_2F_3V_7$
$E_4C_2F_2V_3$
$E_2C_2F_1V_1$

Figure 1-B (continued)

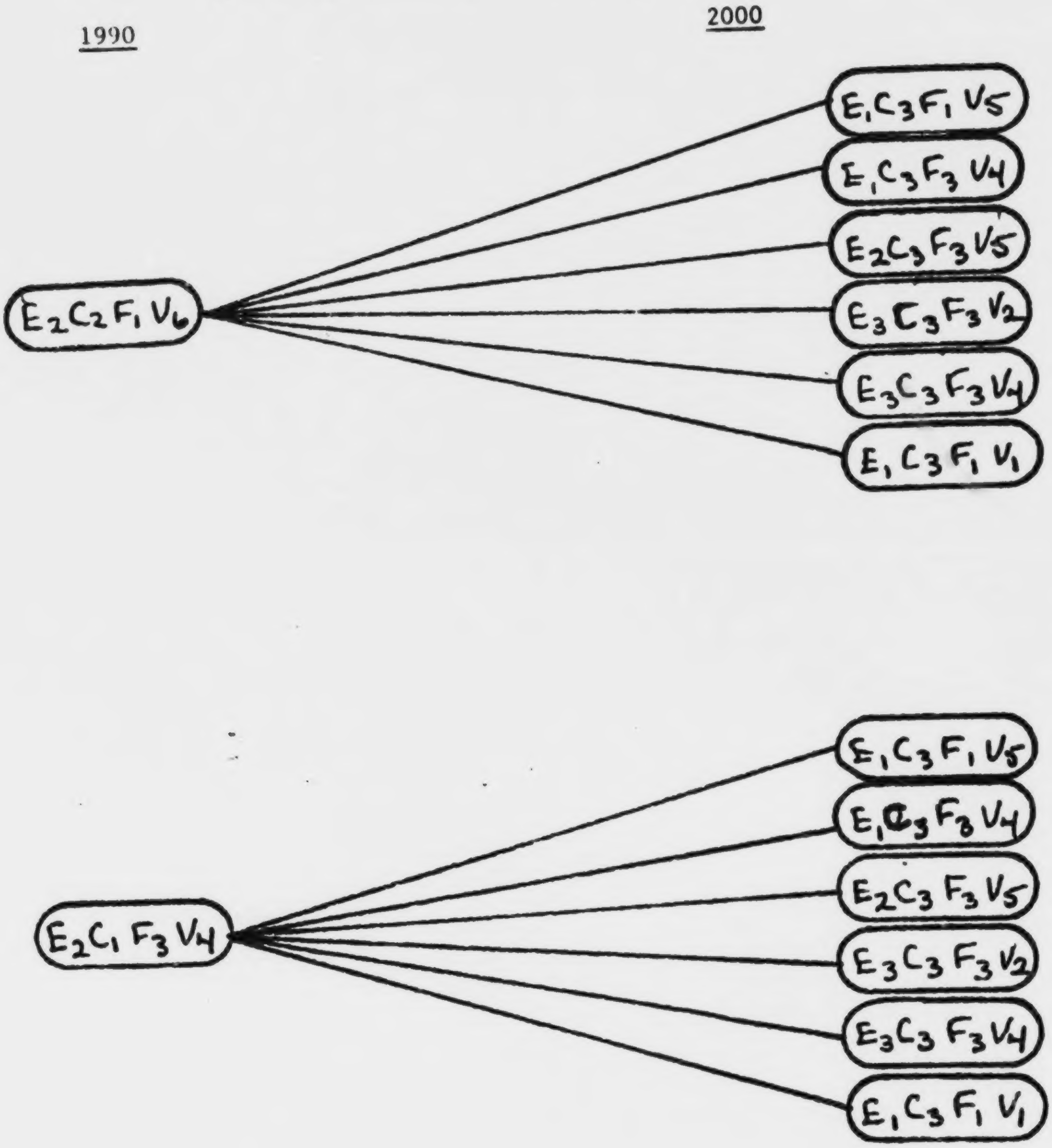
PLAUSIBLE TREND CLUSTERS AND TRANSITIONS: 1990-2000
(assuming worsening climate, C_3, in 2000)


1990
2000
$E_3C_3F_3V_4$
$E_1C_3F_1V_5$
$E_1C_3F_3V_4$
$E_2C_3F_3V_5$
$E_3C_3F_3V_2$
$E_3C_3F_3V_4$
$E_1C_3F_1V_1$
$E_1C_2F_2V_6$
$E_1C_3F_1V_5$
$E_1C_3F_3V_4$
$E_2C_3F_3V_5$
$E_3C_3F_3V_2$
$E_3C_3F_3V_4$
$E_1C_3F_1V_1$

(continued on the next page)

Figure 1-B

PLAUSIBLE TREND CLUSTERS AND TRANSITIONS: 1990-2000
(assuming worsening climate, C_3, in 2000)


1990
2000
$E_2C_2F_1V_6$
$E_1C_3F_1V_5$
$E_1C_3F_3V_4$
$E_2C_3F_3V_5$
$E_3C_3F_3V_2$
$E_3C_3F_3V_4$
$E_1C_3F_1V_1$
$E_2C_1F_3V_4$
$E_1C_3F_1V_5$
$E_1C_3F_3V_4$
$E_2C_3F_3V_5$
$E_3C_3F_3V_2$
$E_3C_3F_3V_4$
$E_1C_3F_1V_1$

Thus, we included paths (transition dynamics) that were both continuous and discontinuous and when the selection was complete we were left with 5 sets for 1990. Starting with these 5 sets, the process was repeated for the transition from 1990 to 2000. Twelve distinct pathways were defined. Two paths were later rejected because, upon further study of the whole scenario skeleton including the three points in time and the transition dynamics, they were considered to have little likelihood of occurring. The end result of this selection process is shown in the skeleton scenarios in Figure 2.

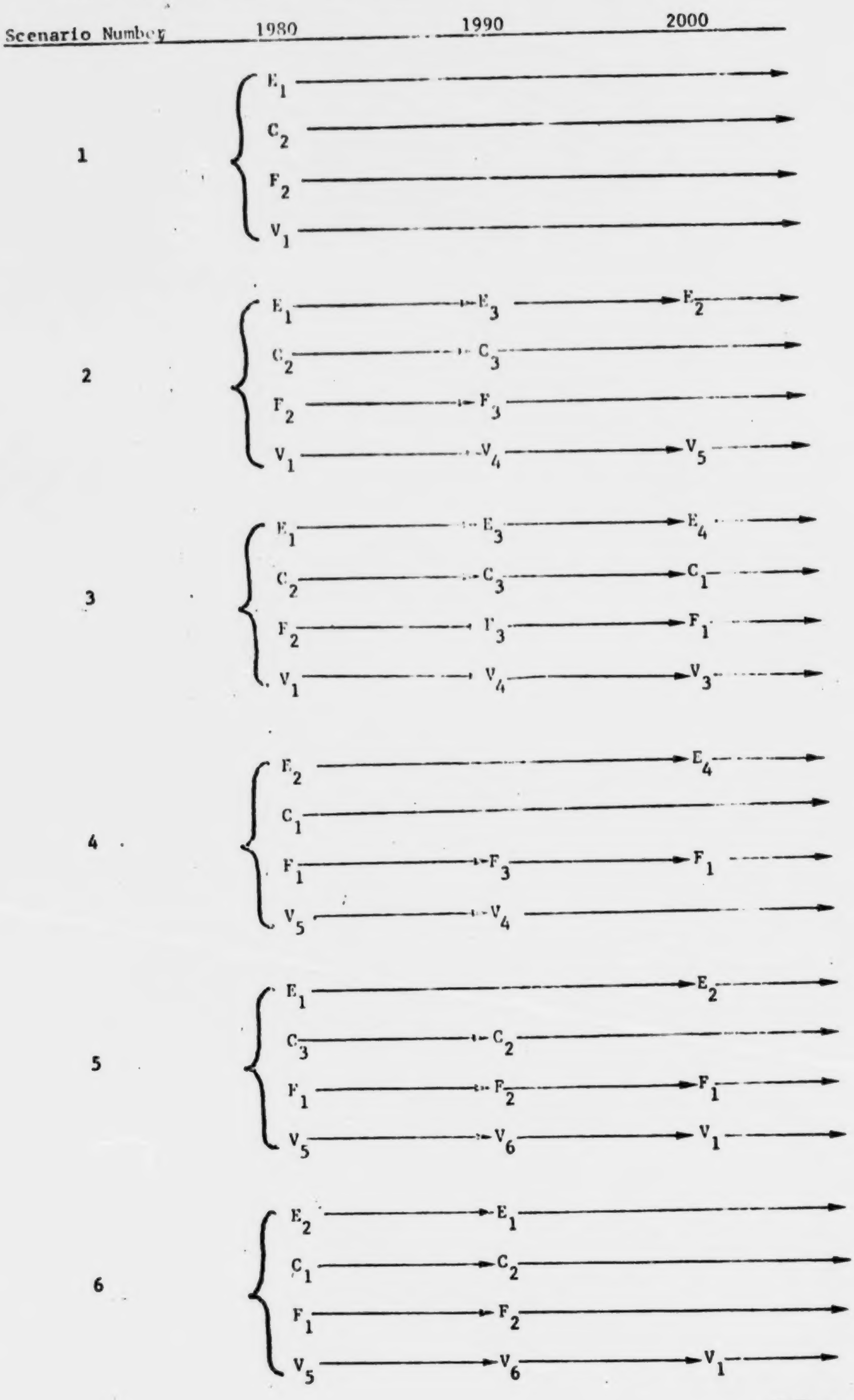
Stage III: Review of Futures Literature

As noted earlier, one of the key methodological issues to be dealt with in a study like this is the problem of bias. Constructing the skeletal scenarios from objective trend data reduced bias considerably. However, there is ample room in the interpretation of these trends for bias to creep in. Therefore, to reduce bias still further, we relied on extant futures literature to give further guidance to the shape of the scenarios. The futures studies we reviewed ranged from those developed using elaborate computer models to those using sophisticated intuition. They reflected various perceptions of the future from optimistic to pessimistic and included the entire political spectrum from left to right.

In selecting the writings, we considered two criteria especially important. The first was that they should present a diversity of images of the future, derived in diverse ways. The second was that the images should be in "good currency," that is, views of the future that have merited the serious attention of the academic, business, or governmental communities, but not necessarily universal agreement as to their validity. Hence this criterion can encompass images of the future as divergent as Daniel Bell's optimistic The Coming of the Post-Industrial Society and Robert Heilbroner's dire An Inquiry into the Human Prospect.

Figure 2

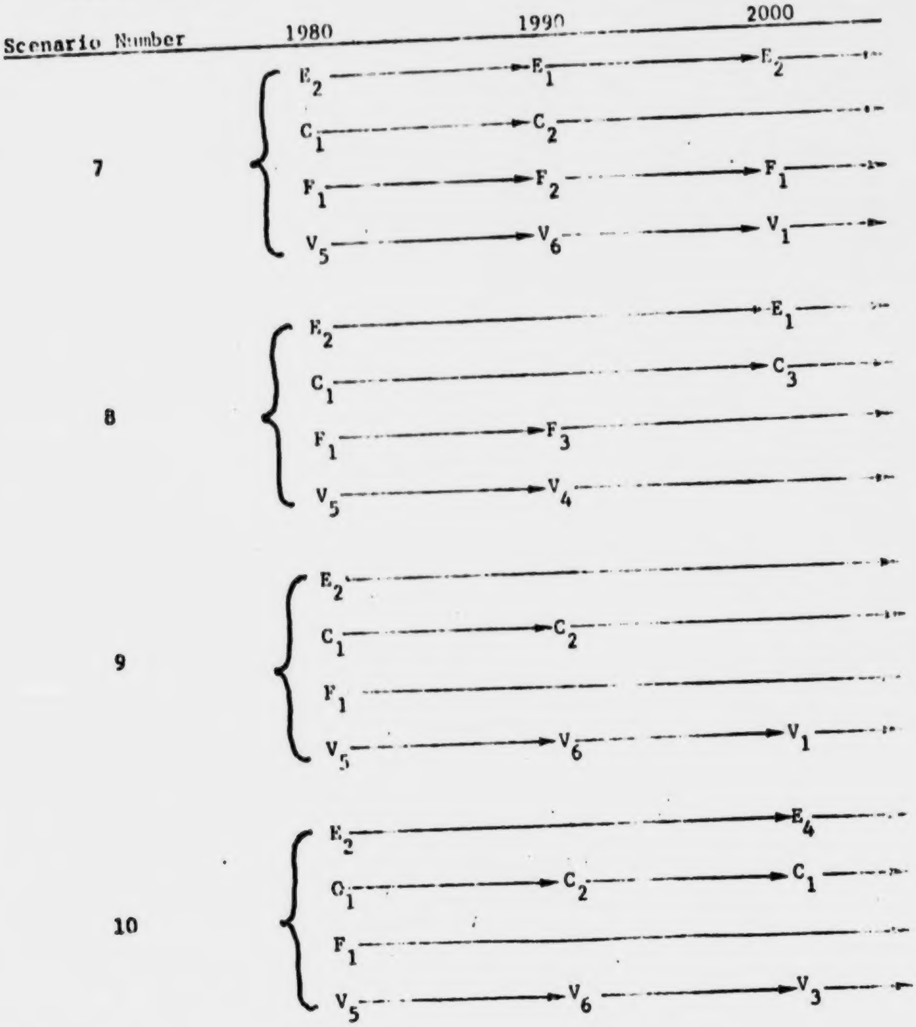
HIGHLY CONGRUENT TREND INTERACTIONS YIELDING SKELETAL SCENARIOS


Scenario Number
1980
1990
2000
1
E1
C2
F2
V1
2
E1 E3 E2
C2 C3
F2 F3
V1 V4 V5
3
E1 E3 E4
C2 C3 C1
F2 F3 F1
V1 V4 V3
4
E2 E4
C1
F1 F3 F1
V5 V4
5
E1 E2
C3 C2
F1 F2 F1
V5 V6 V1
6
E2 E1
C1 C2
F1 F2
V5 V6 V1

28<

Figure 2 (continued)

HIGHLY CONGRUENT TREND INTERACTIONS YIELDING SKELETAL SCENARIOS


Scenario Number
1980
1990
2000
7
E_2 E_1 E_2
C_1 C_2
F_1 F_2 F_1
V_5 V_6 V_1
8
E_2 E_1
C_1 C_3
F_1 F_3
V_5 V_4
9
E_2
C_1 C_2
F_1
V_5 V_6 V_1
10
E_2 E_4
C_1 C_2 C_1
F_1
V_5 V_6 V_3

We briefly reviewed over a hundred different works as potential sources. These included nonfiction books, reports, articles, and science fiction. (The latter was included because at least in a few instances science fiction authors have been remarkably prescient.) This review led to the selection of fifteen different works for analysis (these are listed in Table 3). The analysis consisted of trying to systematically explicate the image of the future and the assumptions held by each author. In some cases these assumptions were quite evident; in others they were implicit and took considerable digging to surface. Each work was assigned to a staff member, who summarized what the author had to say about a number of topics including:

- U.S. economics
- International economics
- Science and technology
- Population/demographics
- U.S. politics
- Foreign relations
- Society and culture
- Environment
- Energy and resources
- Key events
- Critical issues
- Food and agriculture
- Other happenings

From this analysis emerged the sixteen summaries presented in Section III of these working papers.

Analysis of the assumptions of each author was then used to develop a list of 58 descriptors of the future. For example, Dennis Gabor in The Mature Society foresees social evolution as a process of maturation. Thus one dimension along which a future can be described

Table 3

FUTURES LITERATURE SELECTED FOR ANALYSIS*

Bell, D., The Coming of Post-Industrial Society.

Brunner, J., The Sheep Look Up.

Brunner, J., Stand on Zanzibar.

Drucker, P., The Age of Discontinuity: Guidelines to Our Changing Society.

Gabor, D., The Mature Society.

Heilbroner, R.L., An Inquiry into the Human Prospect.

Heller, A., ed., The California Tomorrow Plan.

Kahn, H., and Bruce-Biggs, B., Things to Come: Thinking About the 70's and 80's.

Meadows, D.H., et. al., The Limits to Growth.

Mesarovic, M., and Pestel, E., Mankind at the Turning Point--The Second Report to the Club of Rome.

Mitchell, A., Lifeways and Lifestyles.

Pacific House Associates, Inc., An Organized Look at the Future: A Systematic Approach to New Business.

Pirages, D.C., and Ehrlich, P.R., Ark II--Social Response to Environmental Imperatives.

Wylie, P., The End of the Dream.

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*Further information on these books is given in the bibliography in Volume I.

is whether it is "mature" or "immature." After generating the list (examples of which are shown in Table 4), a natural structure suggested itself that included the following categories: the individual, social systems, productive systems (i.e., the economy and knowledge), and ecosystems. This categorization was largely a matter of operational convenience and does not indicate any attempt to create a structural model.

Stage IV: Expanding of Skeletal Futures

The details of each skeletal future developed in Stage II were then filled in using the descriptors identified in Stage III. This step required the subjective process of consistency matching. Working as a group, the project staff judged for each descriptor what particular state of that descriptor would be most consistent with each point in time for each skeletal scenario. Also, we were mindful of other authors' assumptions about when and under what conditions the emergence of a future with these characteristics seemed plausible.

For example, in Scenario 3: "Apocalyptic Transformation," the high degree of economic success in 1980 led us to conclude that, with respect to the degree of social cohesion, this would be a time of high consensus. Howevever, we assumed that the near economic collapse of the mid-1980s would result in a fracturing of that consensus by 1990. We then assumed that the following decade, which is marked by a slow and successful recovery in a new direction, would lead again to high consensus and social cohesion.

The state of each descriptor for each scenario is shown in the scenario tables in Volume I of the report. Societal structures defined by these tables became a primary source for the narrative text of the scenarios. In the writing process some liberty was taken to give the scenarios life and color so that they would be sufficiently evocative

Table 4

EXAMPLES OF SCENARIO DIMENSIONAL DESCRIPTORS

Individual

- Rationalist versus intuitive
- Rigid versus adaptive
- Frugality versus conspicuous consumption
- Secular versus spiritual
- Competitive versus cooperative
- Valuing present versus future
- Cyclical versus evolutionary

Ecosystems

- Man above nature versus man=nature versus nature above man
- System view versus discrete view
- Fragile versus resilient environment
- First-order versus multiple-order consequences
- Differentiated versus undifferentiated growth

Productive Systems

- Production for profit versus use
- Fragmented versus concentrated industry
- Government versus self-regulation
- Continued versus diminished faith in science and technology
- Resource scarcity versus resource abundance
- Population growth versus population stabilization
- Decentralization versus centralization

Social Systems

- Pluralist versus homogenous world
- Internal homogeneity versus heterogeneity
- Collectivist versus individualistic
- Systems continuity versus malfunction/collapse
- Technocratic ethic versus humanistic ethic
- Continuous versus discontinuous

to give the reader a "feel" for that future. The final step entailed several iterations of review to ensure the internal consistency and congruence of each scenario.

Advantages and Disadvantages of the Methodology

This approach has a number of advantages to commend it. Among them are:

- Assumptions in each scenario are made clear and explicit
- Monitoring for reality testing is facilitated
- A diversity of images are included
- A focus on policy relevance is maintained
- Rich and evocative scenarios result
- The methodology can be repeated by others since it is embodied in a number of defined steps.

If the resources are available, we believe that this approach is a powerful tool for exploring alternative societal futures and that it can help illuminate the veil of uncertainty before us.

The single major disadvantage of this approach is the time and money necessary to perform the analysis. The research process required the skills of a number of professionals in a variety of disciplines over an extended period. Very few organizations have the time, skills, or funds to devote to this type of project.

Another potential disadvantage is that although the approach is methodical, it relies extensively on subjective judgment. Thus, even though the steps in the process are clear and replicable, it is possible that a different group of researchers might reach significantly different results. However, we do believe that the various steps inherent in the approach were designed to minimize the effects of the personal biases of the researchers.

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SECTION II

OVERVIEW OF KEY TREND AREAS

One component of the methodology required the analysis of key trends which would significantly affect the future along dimensions of concern to the client--Environmental Protection Agency/Office of Pesticide Programs. In order to identify those driving trends, we first examined a large universe of potentially relevant trends. From that universe we selected a trend subset that included both major societal trends (e.g., value changes, international societal changes, etc.) and trends that were clearly relevant to the Environmental Protection Agency (e.g., food supply and demand, energy, demand for pesticides, etc.). The purpose of this analysis was not to conduct original research; rather, the intention was to acquire an overview of these important trend areas so that we could make informed judgments when constructing plausible alternative futures scenarios. In consultation with the Environmental Protection Agency, ten major trend categories were selected for review:

- Climate
- The demand for food and fibers
- The supply of food and fiber and the demand for pest control
- Energy
- Ecological implications of pesticides
- World societal trends--1975-2000
- Trend projection for international conflict--1975-2000
- Agricultural foreign aid policy
- Comments on the outlook for cancer in society
- Trends in ways of life.

CLIMATE*

Introduction

Considered as an uncontrollable agricultural input, weather may be defined as some combination of annual temperature, moisture, and wind patterns that determines a specific region's ability to produce desirable agricultural commodities in "economic" quantities. In view of the evolution of agricultural production technology and the resultant heavy reliance on a land-based mono-crop agricultural output system, even modest vagaries in "established" weather patterns can have serious implications for the world population. Some examples include: a potential corn crop of about 6.7 billion bushels in the United States in 1974 dropped to about 4.7 billion bushels because of weather; massive purchases of U.S. wheat in 1972 by the Soviet Union were due to weather; the periodic depression in fishmeal supplies from Peru are due in part to weather; and the relatively rapid decline of whole civilizations in the Indus Valley and certain other regions in ancient times is believed to have resulted from deterioration of agriculturally productive weather patterns.

For the purposes of this analysis, short term or spot variations in "established" weather patterns will not be considered. Despite the inherent difficulties in medium- to long-term weather forecasting, specifically as it pertains to selected regionalized agricultural output situations, this category has been included as a vital trend because of recent concern that the world's weather may be entering a period of decline (from an agricultural point of view). The implications for pesticide policy are both profound and profuse. For example:

- "Subtle" changes in weather patterns can seriously affect agricultural output potentials in certain regions. A

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*Prepared by Thomas A. Blue.

shift in the rain drop from the annual monsoon in Southern Asia may be a subtle change from a meteorological point of view, but it can disastrously affect the agricultural efficacy of the subcontinent. "Slight" changes in the length of growing seasons in areas generating the bulk of the world's grain can seriously impinge on yields per acre and concomitant food costs. Changes of this kind might lead to altered ratios between pest control costs and commodity value per acre that could increase the economic incentive for pest control.

- Even subtle changes in weather patterns can markedly influence pest incidence problems. The corn blight outbreak in the Midwest in 1971 was weather-related (although the variety of corn planted that year was also a major factor). On the other hand, long term cooling trends or changes in moisture patterns might be expected to minimize the incidence of outbreaks of certain insect complexes, and increase the incidence of others.

Data Development--Sources, Methodology, Monitoring

The development of some type of directed medium- to long-term weather forecasts is admittedly difficult, although there is work being done along these lines that should be useful. According to Lamb (Lamb, H. H., Director, Climatic Research Unit, School of Environmental Sciences, University of East Anglia, Norwich, England, "Climatic Change and Foresight in Agriculture: The Possibilities of Long-term Weather Advice," Outlook on Agriculture, Volume 7, No. 5, 1973, Imperial Chemical Industries Ltd., Plant Protection Ltd. Subsidiary, pp. 203-210):

> To meet the demand for forecasts and advice on future climatic trends, the first needs are:
>
> (i) to establish the longest and most comprehensive possible observational data record of the behaviour of climate and atmospheric circulation in the past,
>
> (ii) to analyse that record in such ways as will identify the processes at work in bringing about climatic fluctuations and longer-term changes,

> (iii) to identify the time-scales and spatial characteristics of those processes, and
>
> (iv) to monitor the evolution of global climate from year to year, watching the evolution of the current cycles of all relevant circulation processes and influences external to the Earth-atmosphere system.
>
> These are the objectives which the Climatic Research Unit, set up in 1972...is intended to pursue...Besides the Norwich unit...there is just one important Climatic Research Center at the University of Wisconsin at Madison...and two institutions at Leningrad...

World Weather Perspectives

The current volume of questions about climatic trends reflects growing concern that something may be happening to the world's climate. In the past, periods of bad weather were believed to be spot anomalies or irregularities rather than trend indicators. Irregularities in recent weather patterns were also initially regarded in this manner. However, when viewed against the total weather picture of the last 50 to 100 years, they are no longer being dismissed so lightly, and many now believe that basic changes in weather patterns are occurring. The question is whether they will be short lived or permanent.

The following text summarizes very well recent analyses [illegible] apparent changes in climatic patterns which have generated much of the concern over the direction of future trends.

John Ross, University of Wisconsin - Madison, "Climatic Variability," California Farmer, May 17, 1975, p. 34-35.

> There is now a great deal of field evidence that the past few years have been prone to climatic extremes. 1972 and 1974 in particular produced bad crops in so many of the world's food-producing areas that stocks have been depleted. The events that arouse these uncertainties derive from a very mixed situation: drouth in some areas, floods in others, frost in summer, late winter snows, unexpected winds. There is no single sign to the anomalies. That is a key statement. Let me give you some specific statements of trends that are not as

obvious as crop-related weather anomalies, i.e., drouth in the Cornbelt:

(1) The area of snowcover and pack-ice in the northern hemisphere surviving at the end of the summer increased by 12 percent between 1971 and 1972. Since that time it has remained at the higher level, leading to a significant decrease in absorbed solar radiation at the surface.

(2) 1972 and 1973 were extremely heavy ice years in the channels of the Canadian Arctic Archipelago. Since 1951 the surface temperature of the North Atlantic has declined about one-eighth of the difference between recent temperatures and full glacial temperature conditions, and the Gulf Stream has shifted southward. As a result the growing season in England has diminished by two weeks.

(3) The Sahelian area of Africa is in its seventh year of drouth, precipitated by the failure of the monsoons. In Asia, the frequency of drouths in northwest India has begun to increase. The monsoon has withdrawn southward in Japan. Typhoon patterns have swung widely in the Philippines.

(4) The average temperature of the northern hemisphere has declined nearly as much as it rose in the last 70 years. The size of the circumpolar vortex has increased, and the latitude of the subtropical anticyclones has decreased.

(5) Midsummer frosts have returned to the upper midwestern United States, and across Japan the prevailing location of westerlies has shifted southward. There has also been a southward shift of westerlies in the United States, so that in the winter the westerlies now lie across the Gulf instead of further north.

In sum, the globe is colder, weather is more erratic and there have been major shifts in what we have assumed as normal temperatures, normal rainfall amounts, and normal rainfall and

> temperature distributions. In addition, the biennial oscilation, i.e., a shift from one extreme to another on a nearly biennial basis, seems to have been amplified.
>
> The average temperature of the northern hemisphere has been declining since about 1945. Prior to that time the temperature had been rising, especially since 1920. To a certain extent this atmospheric cooling was concealed by the temperature of the oceans. Now the oceans appear to have cooled, and there is a more blatant expression of the overall cooling in the form of erratic weather.
>
> Thus, we pose the climatic question: What is the real nature of the recent climatic instability? Is it due to a major and persistent flip to a glacial mode, or is it something that will quickly correct itself? Since the recent warm period is highly anomolous on the long perspective, the statistical evidence at least favors a persistence of the cooler period.

If the reasons for changes in past and recent weather patterns were better understood, the future could be more readily assessed. Unfortunately, theories on weather changes differ widely and none have been proven. One theory suggests that man-made pollutants--notably carbon dioxide and particulates--are a key factor interfering with mechanisms of heat energy exchange in the atmosphere; volcanic dust, which is periodically injected into the high atmosphere by major eruptions, has some comparable effects and is also thought to be a factor. In other theories, variations of solar energy associated with sun spot activity is suspected. And in still another, periodic tilting of the earth's rotational axis is considered to be the cause of historical cooling and warming trends.

Basically, climatic change is associated with the circulation of the earth's atmosphere. Even slight overall average temperature changes--whether the cause or the effect of climatic variation--are related to changes in the world's large-scale circulation patterns, which determine the pattern of weather systems and air flows in any given area and thus establish its climate. The strength of atmospheric circulations that characterized the 1900-1950 period, for example, is thought to be responsible for the stable warming trend over this time frame because of the freer and more rapid exchange of heat. With the cooling that has been observed more recently, a return to weaker circulations is feared which could cause more extreme conditions (hot, cold, dry), such as those prevalent in the 1800s.

Unfortunately, research on the subject of climatic change is hampered by a lack of data. With the exception of isolated instrumental observations and diarists' accounts, definitive weather records go back only 100 years or so. This lack of historical data has, until recently, biased understanding of climatic variability. For example, widely-known differences in past climate (e.g., the ice ages) used to be taken for granted as historical phenomena only. However, as climatologists have been gleaning more sophisticated insights into past climatic variability--by piecing together information on ice cores, lake sediments, tree growth rings, wine harvests, and so on--these perceptions are changing.

Future Trends and Implications for Agriculture

The following quotations provide two recent summaries of potential future climatic trends:

H. H. Lamb, "Climatic Change and Foresight in Agriculture: The Possibilities of Long-term Weather Advice," Outlook on Agriculture, Vol. 7, No. 5, 1973, pp. 203-210.

> The perspective which these (recent climatological) studies give...indicates that our present climatic situation is about four thousand to five thousand years after the warmest phase of the present interglacial period, on the early part of the downward slope towards the next glaciation. Another four thousand years would be expected to bring us roughly to the end of the main forest phases of the climate in latitudes near 50°N. This is not likely to be a steady, slow temperature decline, but one that occurs in stages. There will be many ups and downs on the way, and some runs of a few decades where the climate appears stable...

The demand for forecasts of the probable development of the natural climate over the next 30 to 50 years is so pressing that more than twenty forecasts are known to have been made by various scientific means. All of these must individually be considered inadequate...or based on the idea of a single external control...and long cycles in the evolution of the atmospheric circulation.

There is, however, surprisingly general agreement among them indicating further cooling of the natural climate to about 1980-1990, after an easier period in the early 1970's. Those forecasts which were formulated before 1960-1962 already look reasonably successful...Agriculture in middle latitudes must adapt to changes in mean values and in extremes of rainfall and temperature, but some areas on the fringe of the desert zone are liable to become uninhabitable when the climatic zones shift...

This review of climatic history...raises doubts not only about the advisability of breeding new 'miracle crop' varieties depending on response to some narrow range of climatic conditions, but also about the effects of systematic exploitation of climatic resources...to the limit of their supposed availability. In particular, the increasing rationalization of agriculture and world trade, whereby huge areas concentrate on supplying the world's needs of cotton, wheat, and so on, pushes the producing areas back toward essentially one-crop economies which are vulnerable to climatic shifts.

John Ross, "Climatic Variability," California Farmer, May 17, 1975, pp. 34-35.

Therefore, we are willing to make the following general statements: (Note: we expect this pattern for at least the next decade because of the cooler ocean temperatures and because of the lag effect in ocean temperature change.)

a. Greater variability of climate from year to year and perhaps decade to decade in middle latitudes.

b. More specifically, greater extremes of wet and dry, hot and cold, in middle latitudes in accord with increased meridianal flow in the atmosphere and more frequent blocking of meridianal flow patterns.

c. Reduced rainfall in the poleward portions of the monsoon regions (the Sahel of West Africa, northern India, interior China and possibly parts of Mexico) and less reliable monsoons in general.

d. Cooler summers in general in high latitudes (northern Europe, Canada, all of the U.S.S.R., northern Japan) with shortened growing seasons.

e. Increased summer frosts in the northern U.S., Canada and Russia.

f. Awkward springs in the central U.S. and Europe, with very early budding of perennials followed by cold, wet springs, cooler summers and generally spring-type weather patterns in midsummer.

While we are not fully confident of it, the biennial oscillation patterns lead us to believe that 1975 will be climatically more favorable than 1974. 1972 and 1974 were not as good crop years as 1971 and 1973. In fact, 1970 was not a good crop year, but that fact was partly obscured by world grain reserves.

However, we are not optimistic about 1975 food supplies, having just made the following comparison. Assume a continued 2 percent annual increase in world population. Assume production at the all-time record levels of 1973. (It might be higher. It might be lower. Probably the latter because of inflation-related supply problems.) Assume current trends in declining reserves.

Further assume current patterns of food distribution and consumption. There will be a shortage of food next year equivalent to 130 million people. It is your prerogative, if not your responsibility, to vary the assumptions.

These disquieting indications should mandate that major planning decisions take into account the fact that substantial climatic changes may be developing. At the least, allowance should be made for the possibility of a more extreme and variable range of conditions--particularly as they relate to agricultural viability--in the years ahead than over the past fifty; actually, probabilities of weather conditions derived from available records of the latter part of the 1800s might form a better planning basis than those derived from records of the 1900-1950 period. In any case, it is emphasized that even minor weather variations, increasingly high among statistical probabilities, can have profound effects on the world in general and on agriculture in particular, i.e., there is little reserve in our energy and food resources to meet the consequences of any considerable shifts in climate.

Implications for Pest Control and Pesticides

The following describes some of the positive and negative implications on demand for pest control and pesticides represented by vagaries in weather conditions.

Item	Remarks
1. Crop value	The preceding text implies that we really may be in the beginning stages of a declining weather cycle that--among other things--will gradually impinge on yield characteristics of certain agriculturally productive regions and crop varieties. At the least, it may be expected that there will be more irregularity in future weather patterns from year to year than experienced over the past half century (e.g., during the period of time in which the world's pesticide industry evolved). If so, then the chance for weather-related yield reductions and crop failures is greater; the need for other, hopefully compensating, yield increase factors is greater; and the trend in per-acre crop values should increase. With regard to the relationship between crop values and demand for pest control, it has been almost axiomatic that the greater the per-acre value of the crop, the more justification there is to: (a) optimize yields per acre, e.g., by reducing competition from weeds with herbicides, and (b) protect it from insect and pathogen damage.

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2. Pest incidence	Pest incidence is often determined by weather characteristics. Factors related to a declining weather pattern in agricultural areas that might increase pest incidence, particularly for insects and pathogens, would, of course, depend on the crop grown. However, it might be expected that weather stress on specific crop varieties may make them more susceptible to infestations, particularly diseases. On the other hand, weather-related reductions in per-acre crop yields may make crops less attractive to insects.
3. Changes in crop mix	Identifiable changes in weather patterns may bring about changes in crop mix patterns that will affect demand for pest control. If drought--or at least drier conditions--hit certain regions, crops more suited to dry-land farming might be substituted for other varieities. In many cases, this would only represent the substitution of one set of problems with another. However, if cotton acreage were to be affected significantly on the down-side, certainly there would be a sizable net national decrease in the consumption of chemical insecticides (assuming that cotton currently accounts for close to 50% of the agricultural consumption of insecticides).
4. Utilization of weather in pest management systems	While this item does not precisely fit the discussion of changing weather patterns on demand for pest control, it is worthy of mention. As suggested in item 2 above, weather conditions are an important determinant in the evolution of pest infestations up to or exceeding economic damage levels. Studies are under way to correlate daily weather conditions with variations in both the vitality of plants (hence, their innate resistance characteristics) and the vitality of pest populations. Periods of weather likely to lead to high pest levels can then be more readily identified so that timely and nonexcessive supression measures can be taken.

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THE DEMAND FOR FOOD AND FIBERS*

Food Demand**

In estimating food demand, it is important to distinguish between actual consumption (effective demand) and nutritional need (adequate demand). Poor people, in both developed and developing countries, may not have the purchasing power to make their effective demand correspond to nutritional need; conversely, the rich will likely have sufficient purchasing power to make their effective demand exceed nutritional need. Thus, projections of aggregate demand and supply tend to mask these substantial disparities in purchasing power. Consequently, the future demand for food is discussed in terms of both effective and adequate demand. The effective demand for food is primarily a function of three factors: the number of people in the world; individual levels of income; and individual preferences and customs.

Not only has the absolute number of people increased through history, but the rate of increase of our global population has accelerated (see Figure I). The world population is now growing approximately at the rate of 2% per year. Population forecasts indicate that global population will likely fall between the high projection of 7.1 billion and the low projection of 6.0 billion people by the year 2000. The rate of population growth of the U.S., Europe and the U.S.S.R. has slowed considerably, thereby leaving the bulk of the world's population growth concentrated in three major regions: Africa, Latin America, and Asia. Although population growth rate is high in Latin America and Africa, these regions have substantial amounts of unexploited natural resources--primarily land and water--thus offering some hope that intervention by developed nations with

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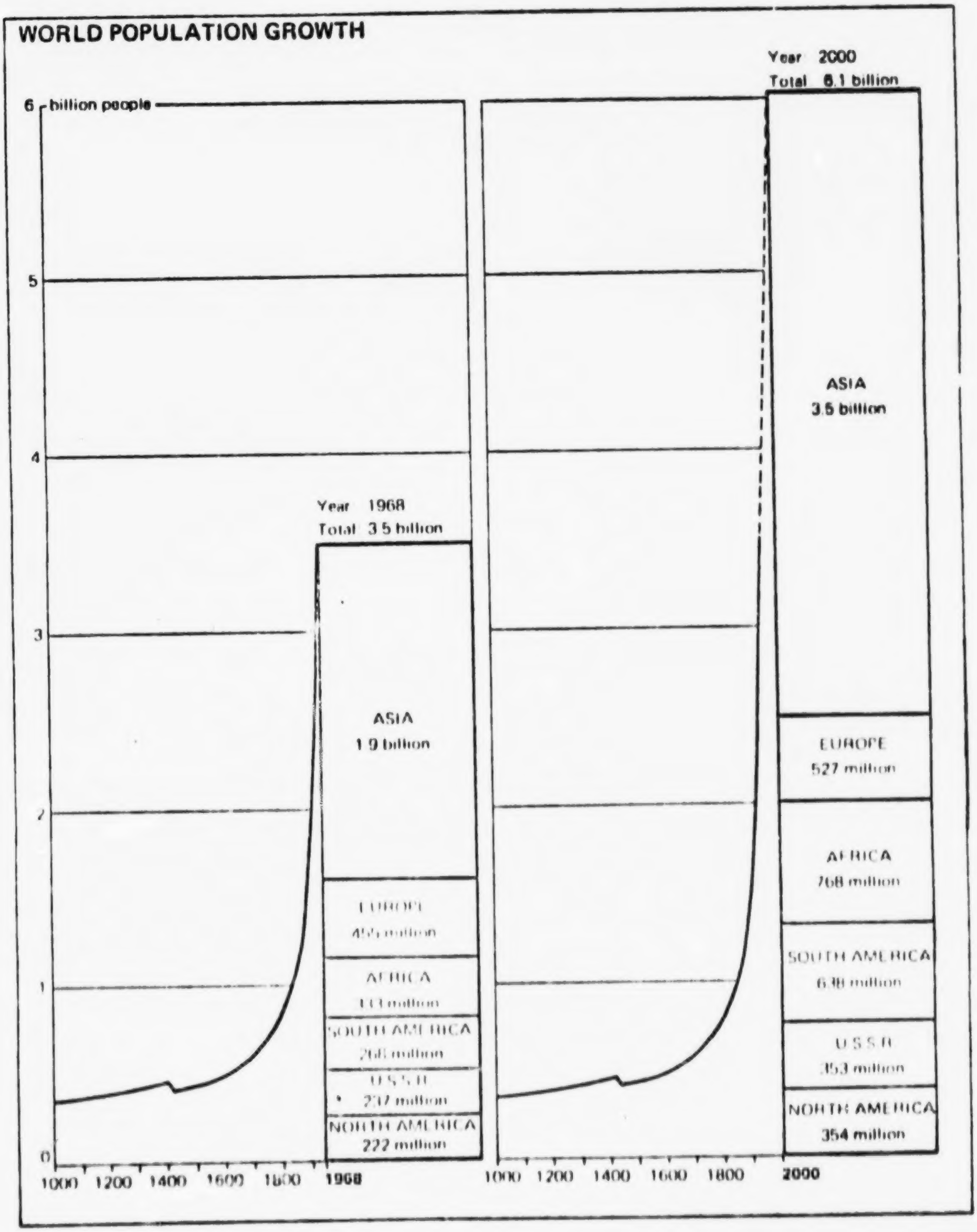
* Prepared by Duane Elgin

** The primary source document for data in this section is the report: A Hungry World: The Challenge to Agriculture, prepared by the University of California Food Task Force, July 1974.

Figure I



Source: McHale, John, World Facts and Trends, (New York: Collier Books, 1972).

appropriate technology (pesticides, fertilizers, equipment) could begin to foster food self-sufficiency. The most critical problems are in Asia where populations are already large (relative to available resources) and continue to increase rapidly.

The food problem has become more than a race between aggregate population growth and aggregate food supply--rising affluence has become a major new claimant upon the world's food resources. For example, it is estimated that Americans consume more than five times as much food per capita as do Indians; this is due to their ability to enforce--through the market place--a disproportionate amount of indirect consumption of grains. In 1973, GNP per capita ranged from more than $5,000 in North America to less than $200 in many Asian and Central African countries. Even these striking regional disparities mask the low purchasing power of the very poor in many developing countries. Inequities in income distribution are even more pronounced in developing countries than in developed countries. Table I shows that on the average, in 44 developing countries, the wealthiest one-fifth of the population received 56% of all income while the poorest one-fifth received only 6%.

These differentials in per capita incomes are further reflected in the shares of income used to purchase food. In 1970, food expenditures as a share of private spending ranged from approximately 15% (in Canada) to almost 63% (in Ghana), with most countries spending between 20% and 40% on food. The poorest sectors within all of these countries spend a much higher fraction of their per capita incomes for food. In the U.S., the poorest sectors oftentimes spend more than 50% of their disposable incomes on food. In developing countries, the poorest sectors spend 80% and more of their disposable incomes for food.

Table II shows net food demand by world and regions for the years 1970, 1985, and 2000. By 1985 there will likely be a 35% increase in world population--the implication is that there will be an average 35%

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Table 1

Income Distribution Estimates: Percentage Shares in Total National Income Going to Population Groups of Different Income Levels in 44 Countries

	Poorest 0-20%	Low middle 21-39%	Middle 40-60%	Upper middle 61-79%	Highest 20%	Highest 5%
Argentina	7.00	10.30	13.10	17.60	52.00	29.40
Bolivia	4.00	13.70	8.90	14.30	59.10	35.70
Brazil	3.50	9.00	10.20	15.80	61.50	38.40
Burma	10.00	13.00	13.00	15.50	48.50	28.21
Ceylon (Sri Lanka)	4.45	9.21	13.81	20.22	52.31	18.38
Chad	12.00	11.00	12.00	22.00	43.00	23.00
Chile	5.40	9.60	12.00	20.70	52.30	22.60
Colombia	2.21	4.70	8.97	16.06	68.06	40.36
Costra Rica	6.00	7.30	12.10	14.60	60.00	35.00
Dahomey	8.00	10.00	12.00	20.00	50.55	32.00
Ecuador	6.30	16.00	13.40	22.60	4.180	21.50
El Salvador	5.50	6.80	11.30	15.00	61.40	33.00
Gabon	2.00	6.00	7.00	14.00	71.00	47.00
Greece	9.00	12.80	12.30	16.40	49.50	23.00
India	8.00	12.00	16.00	12.00	42.00	20.00
Iraq	2.00	6.00	8.00	16.00	68.00	34.00
Israel	6.80	13.40	18.60	21.80	39.40	11.20
Ivory Coast	8.00	10.00	12.00	15.00	55.00	29.00
Jamaica	2.20	6.00	10.80	19.50	61.50	31.20
Japan	4.70	10.60	15.80	22.90	46.00	14.80
Kenya	7.00	7.00	7.00	15.00	64.00	22.20
Lebanon	3.00	4.20	15.80	16.00	61.00	34.00
Libyan Arab Republic	0.11	0.39	1.28	8.72	89.50	46.40
Malagasy Republic	7.00	7.00	9.00	18.00	59.00	37.00
Mexico	3.66	6.84	11.25	20.21	58.04	28.52
Morocco	7.10	7.40	7.70	12.40	65.40	20.60
Niger	12.00	11.00	12.00	23.00	42.00	23.00
Nigeria	7.00	7.00	9.00	16.10	60.90	38.38
Pakistan	6.50	11.00	15.50	22.00	45.00	20.00
Panama	4.90	9.40	13.80	15.20	56.70	34.50
Peru	4.04	4.76	8.30	15.30	67.60	48.30
Philippines	4.30	8.40	12.00	19.50	55.80	27.50
Rhodesia	4.00	8.00	8.00	15.00	65.00	60.00
Senegal	3.00	7.00	10.00	16.00	64.00	36.00
Sierra Leone	3.80	6.30	9.10	16.70	64.10	33.80
South Africa	1.94	4.17	10.16	26.37	57.36	39.38
Sudan	5.60	9.40	14.30	22.60	48.10	17.10
Surinam	10.70	11.56	14.74	20.60	42.40	15.40
Taiwan	4.50	9.70	14.80	19.00	52.00	24.10
Tanzania	9.75	9.65	9.85	9.75	61.00	42.90
Trinidad and Tobago	3.60	5.76	9.16	24.48	57.00	26.60
Tunisia	4.97	5.65	9.95	14.43	65.00	22.44
Venezula	4.40	7.00	16.60	24.90	47.10	23.20
Zambia	6.27	9.58	11.10	15.95	57.10	37.50
Averages	5.6	8.40	12.00	17.71	56.00	30.00

Source: Adelman, I. and C.T. Morris, "An Anatomy of Income Distribution Patterns in Developing Countries," Development Digest, October, 1971.

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Table II

Total Net Food Demand By Regions, 1970, 1985, and 2000
(million metric tons)

	Year[a/]	Cereals	Wheat	Rice	Coarse grains	Roots, tubers	Sugar products	Pulses, nuts	Oilseeds	Vegetables	Fruits	Meat	Eggs	Fish	Milk (total)	Fats & oils
World	1970	466.0	161.6	175.1	129.3	275.3	80.6	38.9	12.7	220.5	142.9	105.7	18.2	42.9	380.6	30.5
	1985	646.2	210.6	257.0	177.6	353.7	122.3	59.2	18.3	327.6	231.4	164.8	27.1	69.1	543.6	44.9
	2000L	783.0	255.2	311.4	215.2	428.2	148.2	71.7	22.1	396.9	280.3	199.6	32.9	83.7	658.7	54.3
	2000M	850.8	277.3	[illegible]	233.8	465.6	161.1	77.9	24.0	431.2	304.6	216.9	35.7	90.9	715.6	59.1
	2000H	930.6	303.3	[illegible]	255.7	509.4	176.2	85.2	26.3	471.7	333.2	237.3	39.1	99.5	782.9	64.6
Europe	1970	47.7	37.7	1.5	8.5	41.2	16.6	3.1	< .1	45.4	38.8	28.6	5.5	8.1	139.0	9.8
	1985	46.2	36.8	1.9	7.7	39.6	21.1	3.7	< .1	59.8	57.7	41.0	7.1	11.6	167.9	11.6
	2000M	51.0	40.6	2.0	8.5	43.7	23.2	4.1	< .1	66.0	63.6	45.2	7.8	12.8	185.2	12.8
USSR	1970	35.5	27.5	.9	7.8	29.7	10.3	1.1	.5	18.4	6.0	11.5	2.0	5.8	66.0	3.2
	1985	36.6	28.8	1.6	6.3	24.4	13.8	1.4	.7	27.4	10.9	17.9	3.3	9.4	97.0	5.3
	2000M	42.1	33.1	1.8	7.2	28.1	15.9	1.7	.8	31.5	12.6	20.6	3.8	10.8	112.5	6.0
N.America	1970	14.7	11.8	.8	2.1	11.9	12.2	.8	.6	26.7	22.8	26.5	4.0	3.5	60.5	5.0
	1985	16.6	13.0	1.0	2.5	13.3	15.5	1.0	.7	34.1	31.1	38.2	4.8	4.8	71.5	6.1
	2000M	19.9	15.6	1.2	3.1	16.0	18.6	1.2	.9	41.0	37.4	45.9	5.8	5.8	85.2	7.4
Oceania	1970	1.6	1.4	< .1	< .1	.9	.9	< .1	< .1	1.4	1.5	2.7	.3	.2	7.4	.3
	1985	2.1	2.0	< .1	< .1	1.4	1.3	< .1	< .1	2.3	2.9	4.0	.4	.4	10.4	.4
	2000M	3.8	2.5	< .1	< .1	1.8	1.6	< .1	< .1	2.9	3.7	5.2	.5	.5	13.5	.6
Asia	1970	295.0	65.0	149.1	70.9	107.7	26.7	25.9	8.3	102.8	42.1	8.5	3.5	16.4	73.8	8.2
	1985	426.2	100.6	218.1	98.6	152.9	47.1	39.4	12.6	163.0	71.0	18.7	6.6	29.3	126.7	14.4
	2000M	540.3	132.2	286.8	129.6	201.0	62.0	51.8	16.6	214.2	93.3	24.5	8.7	38.5	166.6	18.9
L.America	1970	28.3	10.2	6.5	11.5	23.5	11.0	5.2	.7	7.2	22.0	10.4	1.3	1.8	24.1	2.3
	1985	43.8	16.1	10.4	17.4	36.0	17.5	8.2	1.1	12.4	40.4	17.3	2.4	3.6	43.5	4.1
	2000M	65.7	24.2	15.6	26.0	54.0	26.1	12.3	1.7	18.6	60.5	25.9	3.7	5.4	65.3	6.2
Africa	1970	41.2	8.9	4.3	30.5	55.4	4.0	4.1	1.3	10.3	8.3	4.3	.4	2.3	15.3	1.9
	1985	66.5	14.8	7.4	48.4	84.5	7.4	6.8	2.1	17.4	14.2	7.9	.8	4.8	25.9	2.7
	2000M	102.8	22.8	11.5	74.8	120.5	11.5	10.5	3.4	26.8	21.9	12.2	1.2	7.4	39.9	5.2

a/ L=low population variant, M=medium population variant, H=high population variant.

Source: University of California Food Task Force, July 1974, p. 26.

increase in world demand for food. However, given differential incomes and tastes, there are variations around this average. The University of California study projects that by 1985 worldwide effective demand will be less than the 35% projected population increase for only two crops: wheat (30%) and roots and tubers (28%). For all other foods, worldwide effective demand is expected to increase at a rate higher than the rate of growth of population; e.g., rice (47%), meat (56%), fish (61%), eggs (49%). The effective demand for foodstuffs in the year 2000 is naturally much higher than in the year 1985; however, the patterns of the trends appear quite similar.

Nutritional needs (primarily caloric intake and proteins) vary among regions of the world--reflecting differences in body size, climate, physical activity, differences in protein quality, etc. There seems to be a lessening concern for protein shortages and an increasing concern for production of food which provides an adequate caloric intake. Even in nations most threatened by hunger, the existing average intake of protein is well above the recommended minimum level, while there is a deficiency of caloric intake. As indicated in Table III, for most foodstuffs, economic demand is roughly comparable to or greater than nutritional demand. Thus, the distribution of world food supplies will likely remain a more serious problem than total production of crops and animals. However, given vast differentials in purchasing power between and within regions, the world food dilemma will continue: malnutrition and starvation in some areas while food surpluses accumulate in other regions. Adverse climatological changes could, of course, bring total production below anticipated levels and thereby translate the food problem into one of both production and distribution.

The World Food Problem

The foregoing discussion has concentrated on the demand side of the world food problem. We now turn to a review of literature in search of

Table III

Worldwide Economic and Adequate Demands (Energy and Protein) for Various Commodities in 1985

Commodity	Economic demand, 1970	Economic demand		1985 Adequate demand (energy basis)		1985 Adequate demand (protein basis)	
	$(x 10^6$ ton)	(kg/yr/person)	$(x 10^6$ tons)	(kg/yr/person)	$(x 10^6$ tons)	(kg/year/person)	$(x 10^6$ tons)
Cereal	466.0	131.0	646.2	130.3	642.0	57.6	284.2
Wheat		42.7	210.6	46.26	228.21		
Rice		52.1	257.0	47.70	230.22		
Coarse grain		36.0	177.6				
(Maize)		(16.1)	(79.4)	15.00	73.96		
(Millet sorghum)		(13.7)	(67.6)	1 .70	62.60		
Roots & tubers	275.3	71.7	353.7	75.4	372.2	40.5	199.8
Sugar	38.9	24.9	122.8	21.9	108.0	5.3	26.1
Pulses, nuts, oilseeds	12.7	12.0	59.2	12.87	63.5	1.5	7.4
Vegetables	219.0	66.4	327.6	59.4	293.0	34.3	169.3
Fruits	142.4	46.9	231.4	47.1	232.1	21.2	104.6
Meat	105.7	33.4	164.8	25.8	127.0	16.5	81.3
Beef & veal		12.2	60.2				
Mutton & lamb		2.3	11.3				
Pig		10.3	50.8				
Poultry		5.7	28.1				
Eggs	18.5	5.5	27.1	4.80	23.76	2.7	13.3
Fish	45.8	14.0	69.1	9.95	49.1	5.7	27.9
Milk	179.1	49.5	244.2	60.93	300.6	38.2	188.2
Fats & oils		9.1	44.9	9.14	45.1		

Source: University of California Food Task Force, July 1974, p. 38.

a consensus regarding the world food problem--a perspective that embraces both supply and demand. A spectrum of informed opinion is presented in quotation form below:

Lester Brown, "Global Food Insecurity," Futurist, Vol. VIII, No. 2, April 1974.

> Increasing affluence has joined population growth in putting pressure on the world's food supply. Though farmers are producing more food than ever , they can no longer keep up with rising prices. More ominously for the world's near term future, North America has become the source of almost all food entering the world markets and many climatologists believe the continent may now be due for a period of drought...From a global perspective, then, the world is likely to be highly vulnerable on the food front in the years ahead. The poor nations, and the poor people within nations, are in an especially dangerous predicament. (p. 56).

Douglas Ross, "Wanted--World Food Security," The Conference Board RECORD, October 1974.

> Experts are still clinging to the hope that food supply problems will not assume crisis proportions before 1985, but many are now acknowledging that the beginnings of mass starvation are likely to appear before the next decade elapses if there is the slightest decline in crop yields...What many may not realize, however, is that even with maximum food aid from the more affluent temperate regions, there is little chance of meeting the food needs of the underdeveloped countries beyond 1985 without massive efforts to control population, increase indigenous food production and encourage economic development. (p. 32).

Terence McCarthy, "Feast or Famine: The Choices for Mankind," Ramparts, September 1974.

> What this means is that, unpredictably but perhaps frequently, with recurrence of crop failures on an extensive geographic scale... hundreds of millions of people at any time beyond the next quarter of a century could be forced down from bare subsistence to below it, hundreds of millions more from the margin above starvation into starvation itself. As an exercise, not a prediction, assume a 6 billion population in the year 2000, and also assume crop failures equivalent in geographic scope to those of 1972. About 2 billion people could be condemned to death by starvation. One-third of the human race could be exterminated. (p. 30).

Mihajlo Mesarovic and Eduard Pestel, Mankind at the Turning Point, New York: E. P. Dutton, 1974.

> In summary, the only feasible solution to the world food situation requires:
>
> 1. A global approach to the problem.
> 2. Investment aid rather than commodity aid, except for food.
> 3. A balanced economic development for all regions.
> 4. Worldwide diversification of industry, leading to a truly global economic system.
>
> Only a proper combination of these measures can lead to a solution. Omission of any one measure will surely lead to disaster. But the strains on the global food production capacity would be lessened if the eating habits in the affluent part of the world would change, becoming less wasteful.
>
> The situation is more than urgent. Even our "solution" requires drastic, unprecedented changes in the world system. These changes cannot be effected without compromise on the part of the other regions. Even if there is willingness to work toward a solution, such compromises require a lot of time. In this case there is no time...The most thorough analyses of a large number of scenarios using our world system computer model lead to the inescapable conclusion that mankind's options for avoiding catastrophe are decreasing, while delays in implementing the options are, quite literally, deadly. (pp. 127 and 129).

A Hungry World: The Challenge to Agriculture, Summary report by the University of California Food Task Force, July 1974.

> ...Thus, [at least to 1985] the distribution of world food supplies will remain a more serious problem than total world crop and animal production. Short-run market surpluses--i.e., actual supplies in excess of effective demand--are likely to recur in those countries capable of producing food in excess of their consumption requirements. Given the limited purchasing power of many consumers in less developed nations, the world food dilemma will continue: malnutrition and starvation in some areas, while food surpluses accumulate in other regions.
>
> The world's food shortages will continue to be centered in the developing regions of Asia, Africa, and Latin America, but in a broader sense the food problem is worldwide. Effects of human suffering and unrest in the developing regions inevitably will be felt elsewhere. In addition, potential solutions to the world's food problem have their origins in industrialized nations, or at least will require their cooperation...The food situation beyond

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> 1985 is more uncertain...But meeting food production needs during the last 15 years of the 20th century will depend upon accelerated adoption of known methods, development of new technology, and, indeed, some real "breakthroughs." (p. 50).

International Federation of Institutes for Advanced Study, May 1974; reported in Committee for Economic Development, U.S. Farm Policy for Changing World Food Needs, October 1974.

> The studies of many scholars of climatic change attest that a new climatic pattern is now emerging. There is a growing consensus that the change will persist for several decades, and that the current food-production system of man cannot easily adjust. It is also expected that the climate will become more variable than in recent decades. We believe that this climatic change poses a threat to the people of the world. The direction of the climatic change indicates major crop failures almost certainly within the decade. This, coinciding with a period of almost nonexistent grain reserves, can be ignored only at the risk of great suffering and mass starvation. (p. 64).

Nevin S. Scrimshaw, "The World-Wide Confrontation of Population and Food Supply," Technology Review, December 1974.

> New evidence is rapidly accumulating to show the approach of one of those crisis points in history when new elements will force a fundamental discontinuity in the way the twin problems of people and food supply are handled. Simply put, the world cannot long continue with the kinds of trends currently seen in population, land availability, food production, energy use, environmental pollution, and inflation. (p. 13).

> There can be no long-range substitute for increased food production in the developing countries through higher yields and less reliance on North America, but no one believes that this will be easily or rapidly achieved, and it will require far more assistance from the industrialized countries than has thus far been forthcoming. (p. 14).

> Will we continue to respond to the needs of starving people, or will we simply become increasingly callous toward hunger and starvation in many of the developing countries? There is some evidence that many political leaders in both developing and industrialized countries are becoming fatalistic and trying to ignore a problem that has become too overwhelming for them to contemplate or solve. (p. 15).

Joseph Willett (U.S.D.A.), "The Ability of the Developing Countries to Meet Their Own Agricultural Needs in the 1980s," Speech given at the Canadian Agricultural Economics Society, Quebec City, Canada, August 6, 1974.

Despite many uncertainties in the future world food situation, I think predictions of mass starvation are overdrawn. Rather, it is more likely that diets for most of mankind will continue to improve, although slowly, and perhaps erratically. However, I want to emphasize that many difficult problems must be solved if deterioration in the world food situation is to be prevented. The food supply of many of the developing countries is precariously dependent on the weather and on aid from outside. Hundreds of millions are poorly nourished, and many are seriously threatened by food shortages. If the world ignores these problems, then unprecedented catastrophes could develop. I don't believe we will ignore the critical short-run problems. (p. 5).

"Malthus and America,"Subcommittee on Department Operations, Committee on Agriculture, U.S. House of Representatives, U.S. Government Printing Office, October, 1974.

The Subcommittee concludes that unless present trends in population growth and food production are significantly altered, a food crisis that will have the potential to affect everyone from every walk of life will hit with more impact than the energy crisis of 1973-74. Unfortunately most of the citizens of this and every country of the world are yet unaware of the phenomenal problem that looms on the horizon...(p. 15).

These central contemporary questions arise: Should we limit the amount of commodities we export from this country at the expense of our balance of trade and humanitarian interests so we can have "cheap food" here at home; or should we sell all of the commodities we can on the world market to bolster our balance of trade and strengthen the dollar and our economy at the expense of American consumers who will have to pay higher prices for food and hungry people around the world who don't have money to pay for food and will starve as a result; or should we give away large quantities of food to feed hungry people and save lives around the world at the expense of the American taxpayer who would be called upon to finance such a venture and the American consumer who would have to pay higher food prices as a result; or should we establish large governmentally or internationally held and controlled grain reserves which quite possibly could be used against the best interests of the American farmer who in turn would probably reduce production due lack of incentive to produce, at the expense of the American consumer who again would have to pay higher good prices and the American taxpayer who would be called upon to finance the largest portion of any such undertaking? (p.16).

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Gene Koretz, "The Global Food Shortage: A Challenge for U.S. Farm Policy," *Business Week*, June 8, 1974.

> The stark fact is that the threat of large-scale famine around the globe is now more real than at any time in recent memory...With world stocks of grain at their lowest level in years...a major crop failure in India or elsewhere could spell mass starvation unless the U.S. and other food-rich countries devise a strategy for dealing with the contingency. Moreover, this grim situation is not likely to get appreciably better for years. (p. 63).

Lawrence Mayer, "We Can't Take Food For Granted Anymore," *Fortune*, February, 1974.

> But the prospects further out are not so favorable. It seems certain that demand for food will continue to rise--and uncertain that supplies can keep pace. On balance, the demand-and-supply relationship makes it likely that the price of food will go up--perhaps substantially. In addition, food producers face higher costs from a number of different directions, e.g., the costs involved in giving up some efficient pesticides that create ecological damage, and these may also boost prices...
>
> The prospect of some famines in a world grown increasingly small and interdependent suggests that U.S. food prices will be affected by political decisions of a peculiarly sensitive nature. (p. 136).

Graham Molitor, "The Coming World Struggle for Food," *Futurist*, August, 1974.

> Some two-thirds of mankind presently are hungry and malnourished, and widespread food shortages now loom ominously. The human toll in misery defies comprehension, but hunger is an age-old scourge. What is new is that increasingly we have the capacity for overcoming it. We need only the resolve to do the job. This is perhaps the strongest moral imperative of our time...
>
> Perhaps one-third or more of the food which otherwise would be available for human beings is consumed by rodents, insects, fungi, various plant diseases, and other interlopers--rabbits, kangaroos and so on. Better controls could contribute substantially to food stocks available for mankind. Widespread but reasonable use of pesticides is essential to minimize predatory raids on crops. Less understood, however, are the trade-offs involved, that is, the harmful consequences of pesticides. (pp. 169-170).

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Fred H. Sanderson, "The Great Food Fumble," Science, May 9, 1975.

> ...a return to relative abundance of food in the affluent countries will not cure the problem of chronic food shortages in much of the developing world. The "world food problem" will, again, be recognized as being what it always was: the problem of the poor countries, particularly the densely populated countries of South Asia. (p. 508)

Thomas T. Poleman, "World Food: A Perspective," Science, May 9, 1975.

> And so it is that the escalation in food prices during the past couple of years has been accompanied by a revival of the fear, periodic in its emergence, that the world is running out of food and that some cataclysmic Malthusian solution will shortly be upon us. (p. 510). For reasons Malthus could have hardly foreseen, the misery and vice about which he brooded may yet be visited on much of the world. (p. 518).

Harry Walters, "Difficult Issues Underlying Food Problems," Science, May 9, 1975.

> Developments over the past two decades point up four essential facts about food. (i) There is not one but many food problems, and a surprisingly large number of them are the result of human and governmental decisions rather than of immutable forces; (ii) food production can be and has been increased or decreased quite rapidly in "normal" conditions; (iii) food supply and price stability depend largely on stocks of food large enough to overcome shortfalls in production; and (iv) when food prices rise sharply, the poor are adversely affected.
>
> All of the major studies of the world food situation in 1974 lead to generally the same conclusions. (1) There are sufficient resources--of land, labor, water, fertilizer, technology, and other capital--to increase food production substantially, at least in the next decade or two. (2) The major problem is to increase food production in those developing countries that have the potential to do so and that are facing the most severe food deficits. (3) If the trends of the past are not changed: (i) the food deficits of the developing countries will rise from about 20 million tons in 1970 to somewhere between 55 million and 85 million tons by 1985; (ii) the surpluses of the developed countries will match or exceed these deficits; but (iii) the transfer of much of this surplus to the deficit poor countries would have to take place on concessional terms, which seems neither desirable nor likely. (4) Neither famine relief nor world food stability is possible without sufficient stocks of food to overcome unexpected and unpreventable disruptions in supply.

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> (5) Malnutrition is a major problem that results largely, but not entirely from low incomes. To correct this problem requires either an increase in the incomes of malnourished groups, an increase in the food production capacity of those within these groups who are farmers, or transfer of food to these groups. It will probably involve all three. (p. 528).
>
> At the root of the world's food problems are serious imbalances in the availability of resources, the distribution of incomes, and the conditions under which food is produced and traded. Each of these is affected by policy decisions of governments, but none more than the last.
>
> It will obviously not be a simple matter to change the long-standing agricultural and trade policies of the developed, developing, and planned economies. (p. 530).

S. H. Wittwer, "Food Production: Technology and the Resource Base," Science, May 9, 1975.

> Despite a growing population and increasing demands of that population for improved diets, it appears that the world is not close to universal famine. There is enough food now produced to feed the world's hungry. That people are malnourished or starving is a question of distribution, delivery, and economics, not agricultural limits. The problem is putting the food where the people are and providing an income so that they can buy it. As to the future, there are clouds on the far horizon. Only increased scientific and technological innovation, coupled with a change in human behavior and in national policy with regard to increased investments in agricultural research, can avert a growing food and population crisis. (p. 584).

This brief sampling of expert opinion regarding the world food problem reveals a striking degree of unanimity with respect to several central conclusions:

- The problem is seen as a continuing one--likely to endure at least until the turn of the century
- Even those who are optimistic about near-term prospects for feeding the world's population consider the long-term problem one of crisis proportions.

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- To effectively cope with the world food problem will likely require major changes in the attitudes and behavior of developed nations as they relate to developing nations.
- Although food shortages will likely be centered in the developing regions of Africa, Latin America, and particularly Asia, the problem will manifest itself on a worldwide scale.
- Adverse and/or unstable climate patterns will make food policy planning more difficult, thus requiring contingency planning for potentially volatile supply changes from year to year depending upon the vagaries of changing weather patterns.

Demand for Fibers*

The demand for fibers is related to the demand for food, not only because both food and natural fibers must be produced on a finite amount of crop land, but also because the same variables--population, income, consumer preferences--affect both food and fiber demand. A variety of additional demand components affect fiber, however. Drastic shifts, in two of those demand components--petrochemical feedstocks and food crop acreage--have, in recent years, caused a turnaround in the rather sharp increases in fiber demand and left considerable uncertainty about future trends. OPEC-aggravated inflation, high interest rates, rising energy costs, and uncertainty over general business/economic health, and the Government's inflation control policies, further compound the situation.

In the U.S., consumer resistance to higher prices has resulted in a marked slowdown in business activity--particularly in textiles. In addition, the current depression in the housing industry means reduced demand for such items as carpets and draperies. Reduction of retail ordering means cutbacks at the fabric level and ultimately at the raw fiber level. Thus, a situation recently characterized by high demand and raw fiber shortages has suddenly switched to a situation of low demand and relative fiber abundance.

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*Prepared by Michael Reynolds.

U.S. demand for textile goods in general and natural fibers in particular is shrinking. While demand for man-made fiber is about holding steady, the use of natural fiber is dropping. Synthetic fiber, which once represented only a miniscule share of total fiber production, claimed 70% of the market in 1974 and is expected to gain an 85% market share by 1980. Continued decline in the market share of natural fibers can be expected through the 1980s, as substantial improvements in the price-competitiveness of natural fibers seems unlikely.

Of the natural fibers, it is particularly important to consider cotton, as it is this country's only widely-produced vegetable fiber, and the only natural fiber using significant amounts of pesticides--often as much as a third of the total. A sharp decline in cotton acreage is likely in view of current relatively low profit expectation for cotton and very attractive price prospects for cotton's main competitors--soybeans, corn, and grain sorghums. With cotton production costs likely to increase further, farmers are turning to lower-risk food crops that offer a far greater profit potential. Thus, the combined impact of synthetic fiber competition in the market place,and food crop competition in the field means further decline in cotton production. The near-record production level of 6.2 billion pounds of cotton in 1973 should level off to an average of 4-5 billion pounds per year over the next decade. Even foreign markets, which have bolstered demand for U.S. cotton production in the past, are considerably weaker, due to relatively large cotton stocks in consuming countries.

World fiber demand is considerably different than U.S. demand. Although the growth in per capita fiber demand is expected to decline, world demand for all fibers should more than double between 1970 and 2000, from 21.7 million tons to 48 million tons. Because synthetic fiber demand is much lower outside the U.S., more than half of the total world fiber demand will be for cotton until after 1980 when synthetics, mostly polyesters, will reach the level of cotton. World fiber demand projections are shown in Figure 2.

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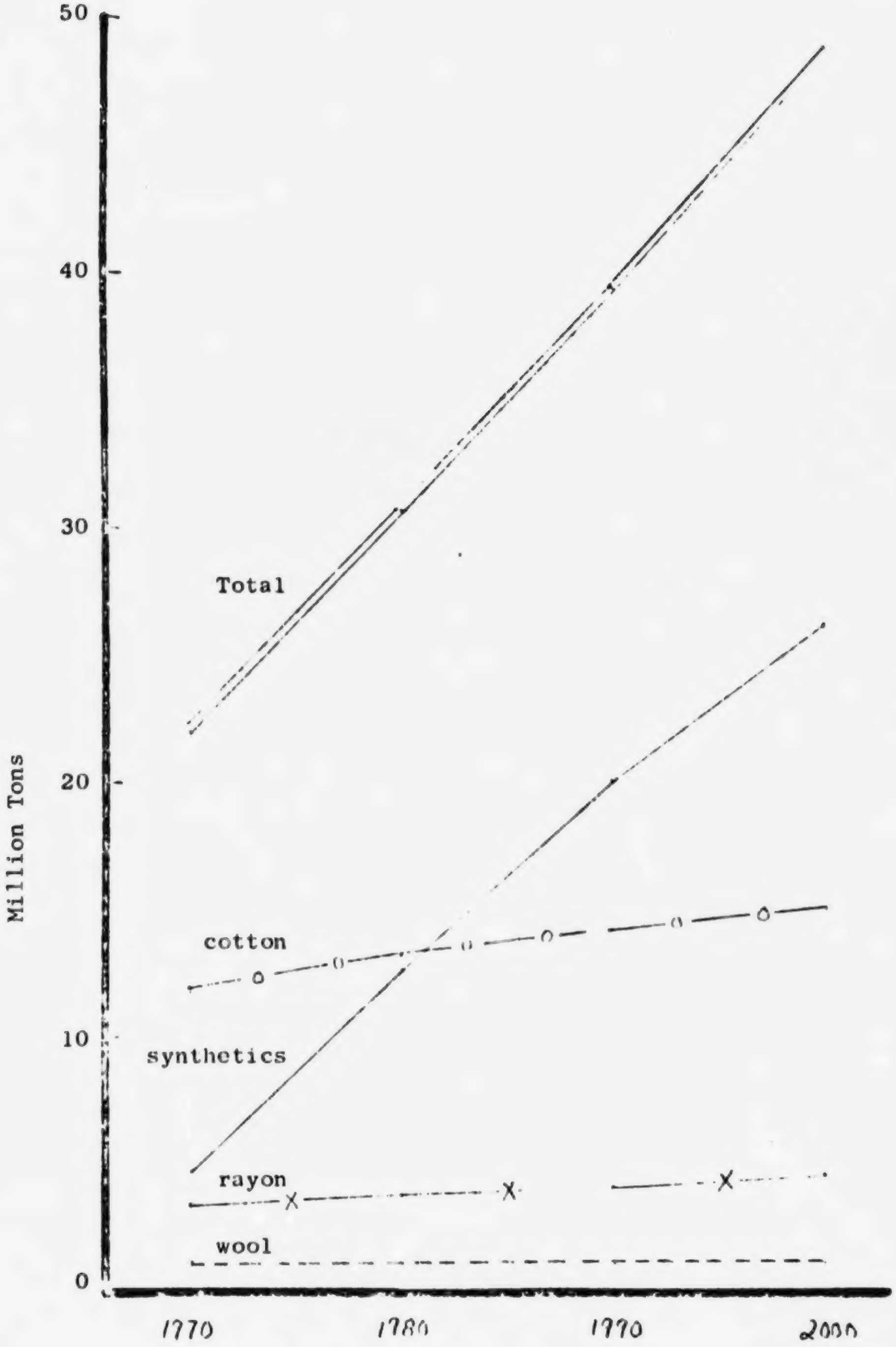
Figure 2
Projected World Fiber Demand 1970-2000



Source: Compiled from various issues of European Chemical News (January 1973-June 1975).

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THE SUPPLY OF FOOD AND FIBER AND THE DEMAND FOR PEST CONTROL*

Introduction

Two basic and elemental component trends for defining alternative futures for pesticide policy are: (1) the demand for pest control, and (2) the supply of food and fiber. These two components are so interdependent that they interactively define each other and need to be analyzed jointly.

Demand for pest control is measured by the actual usage of pesticide materials for the control of target pests--including weeds, insects, pathogens, etc. We will limit our analysis to those crops which have used significant amounts of pesticides in the past. Although it is possible that significant new uses for pesticides will evolve, it is unlikely that these would involve significant acreages of crops not included in our analysis.

The following table includes those crops which used the greatest amounts of insecticides, herbicides, and fungicides in 1971. Use here is defined as the number of pounds of synthetic organic, inorganic, botanical and biological pesticides, excluding petroleum and sulfur, actually applied to crops in 1971. These crops account for 75 percent of all the pesticide materials applied in 1971; the remaining 25 percent of the pounds applied is spread over a wide variety of crop, non-crop and livestock minor uses too numerous and non-specific to warrant detailed individual use analysis.

From Table 1, it can be seen that fifteen (15) crop categories as defined from the past usage of pesticides in turn define the crops to be emphasized in analyzing the trend component referred to as the supply of food and fiber. It is postulated that the future demand for pest control

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*Prepared by Peter Stent.

Table 1

PESTICIDE USE BY CLASS AND CROP: 1971-*

Insecticides

Crop	1000 lbs.*	% of Total	1000 Acres†
Cotton	73,357	48	17,957
Corn	25,531	17	28,464
Peanuts	5,993	4	2,040
Soybeans	5,621	4	4,883
Apples	4,831	3	1,351
Tobacco	3,999	2.5	1,352
Citrus	3,049	2	1,299
Potatoes	2,770	2	1,702
Alfalfa	2,276	1.5	2,698
	127,427	84	

*Total pounds of insecticides not including petroleum.

†Includes multiple applications.

Fungicides

Crop	1000 lbs.	% of Total	1000 Acres
Citrus	9,300	24	1,846
Apples	7,200	18	1,194
Peanuts	4,400	11	2,479
Potatoes (Irish)	4,100	10	892
		63	
Vegetables	5,700	14	1,027
Deciduous Fruit	3,800	10	1,063
Other Fruit and Nuts	3,100	8	1,408
	37,600		

Herbicides*

Crop	1000 lbs.	% of Total	1000 Acres
Corn	101,060	45	80,408
Soybeans	36,519	16	37,684
Cotton	19,610	9	19,670
Wheat	11,622	5	25,505
Sorghum	11,538	5	11,525
Pasture and Range	8,336	4	7,532
Rice	7,985	3	2,653
Peanuts	4,374	2	2,698
	201,044	89	

*Not including petroleum. No other individual crop uses in excess of 1% of the total herbicides used in 1971.

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*Crops selected based on quantity of pesticide used. The crops included account for 74% of all pesticides used in 1971.

Source: USDA, ERS. "Farmers' Use of Pesticides in 1971...Quantities," Agricultural Economic Report No. 252.

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will be a function of the supply of these 15 crops (hereafter used generically to refer to the crop categories) as defined by their acreage, yield, and value.

Table 2 shows a time series of the harvested acreage for the pertinent crops. Pesticide use in terms of pounds applied is calculated from the product of the acres, percent of acreage treated, number of applications, and the rate of application as shown in the following equation:

$$\text{Use (lbs.)} = A*\%*N*R$$

where: A = total acreage of the crop in the U.S.
% = percent of A treated
N = number of applications per treated acre per season
R = rate per acre in terms of pounds of active ingredient applied per acre per application

It should be pointed out that some alternative methods of pest control, especially in the future, may not be defined in terms of pounds applied per acre (e.g.,predators and parasites), but comparable units (such as $) could be used.

These introductory remarks and tables should serve as adequate emphasis on the intimate linkage and interdependent relationship between the demand for pest control and the supply of food and fiber. We will now proceed to analyze each independently and to project future trends.

Supply of Food and Fiber

Pesticides are generally applied on an acreage basis; therefore, acreage will be used as the base trend for analysis. However, yield and value per unit of yield are also important trends which have significant influence on the ultimate demand for pest control. As yields increase, less acres are needed to achieve a desired level of production, and with constant prices per unit of yield, the value of the production per acre increases. If there is a simultaneous increase in the value per unit of

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Table 2

PRINCIPAL PRESTICIDE USING CROPS: HARVESTED ACREAGE
(MM Acres)*

	1974	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964	1963	1962	1961	196
Alfalfa*		27.23≠	26.95	27.53	27.20	26.63	26.96	28.00	28.95	29.71	29.38	28.49	28.26	28.27	27.5
Apples≠	.449	.432	.428	.464	.465	.498	.396	.393	.411	.437	.454	.416	.414	.410	.3
Citrus*		1.16≠	1.17	1.18	1.12	1.07	1.00	.952	.881	.834	.781	.775	.838	.807	.7
Corn*	63.7	61.76	57.42	64.05	57.36	54.60	55.88	60.56	56.93	55.33	55.37	59.23	55.73	57.63	71.4
Cotton*	13.07	11.99	12.98	11.47	11.16	11.06	10.16	8.00	9.55	13.62	14.06	14.21	15.57	15.63	15.3
Peanuts*	1.49	1.50	1.49	1.45	1.47	1.45	1.44	1.40	1.42	1.44	1.40	1.40	1.40	1.40	1.4
Potatoes (Irish)*	1.38	1.30	1.25	1.39	1.42	1.41	1.38	1.46	1.46	1.38	1.27	1.32	1.35	1.48	1.3
Rice*	2.38	2.17	1.82	1.82	1.82	2.13	2.35	1.97	1.97	1.79	1.79	1.77	1.77	1.59	1.6
Sorghum*	13.60	15.94	13.37	16.30	13.57	13.53	13.99	14.99	12.81	13.03	11.74	13.33	11.57	10.99	15.6
Soybeans*	52.41	56.42	45.70	42.70	42.25	40.98	41.10	39.77	36.55	34.45	30.79	28.62	27.61	27.00	23.6
Tobacco*		.892	.842	.839	.898	.920	.880	.960	.974	.977	1.08	1.18	1.22	1.17	1.1
Wheat*	63.70	53.88	47.28	47.67	43.56	47.58	55.26	58.77	49.87	49.56	49.76	45.51	43.69	51.57	51.8
Commercial Vegetables*		3.43	3.32	3.26	3.19	3.35	3.65	3.58	3.42	3.29	3.27	3.31	3.42	3.46	3.3
Major Deciduous Fruits and Nuts (excluding apples)		1.501	1.491	1.431	1.432	1.465	1.556	1.543	1.518	1.496	1.475	1.506	1.514	1.506	1.5
TOTAL		239.6	215.5	221.6	206.9	206.7	216.0	222.3	206.7	207.3	202.6	201.1	194.4	202.9	217.1
Harvested Cropland		322.3	290.6	302.0	294.1	290.4	298.8	304.0	288.0	294.4	293.7	293.2	289.2	297.7	318.9
%		74.3	74.2	73.4	70.4	71.2	72.3	73.1	71.8	70.4	69.0	68.6	67.2	58.2	68.1
Pasture and Rangeland						886					918.0				

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*The above crops account for 74% of all pesticides applied in 1971. See Table 1 for detail.

≠1970-72 average.

≠Estimated from 1969 Census of Agriculture, Special Reports, Part 6, Volume V.

Source: USDA Agricultural Statistics (1974), USDA Supplemental Statistical Report; SRI.

yield with absolute increases in yield itself, the value of production per acre increases dramatically.

On the other side of the ledger, there is the constant input cost push on prices and the resultant cost-price squeeze which puts pressure on the farmers to not only hold down the absolute level of input expenditures, but adjust the mix of input components to achieve the least cost combination of inputs possible to maximize yields. This results in the substitution of one input for another as the relative marginal productivities of the various inputs change.

So there are two significant factors in the costs and returns per acre of harvested crop which influence the demand for pest control. Of course, this assumes an economic level of infestation which will be dealt with in depth in the section on demand for pest control. As the value of the crop per acre increases--whether it be from yield increases, value per unit of yield increases, or both--the desire of the farmer to protect the increasing return per acre also increases. In addition, the relative marginal productivity of pesticide inputs to protect the incremental value in return increases as long as the marginal cost of pesticide input is exceeded by the marginal return. Probably more important from the farmers' viewpoint is that the absolute cost of the pesticide inputs as a percentage of all input costs has historically been relatively low, especially in light of the concept of insurance against total crop failure. In other words, pesticides have been cheap, seldom exceeding 10 to 15 percent of the total direct input expenses and oftentimes considerably less, and pesticide costs are covered by a relatively few units of return of crop value.

Figure 1 and Table 3 give detailed time series data for the important pesticide using crops. The important data factors to examine are the harvested acres, yield per acre, and dollar return per harvested acre.

The significant trends illustrated by these tables are summarized below:

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Figure 1

PRINCIPAL PESTICIDE USING CROPS - HARVESTED ACRES

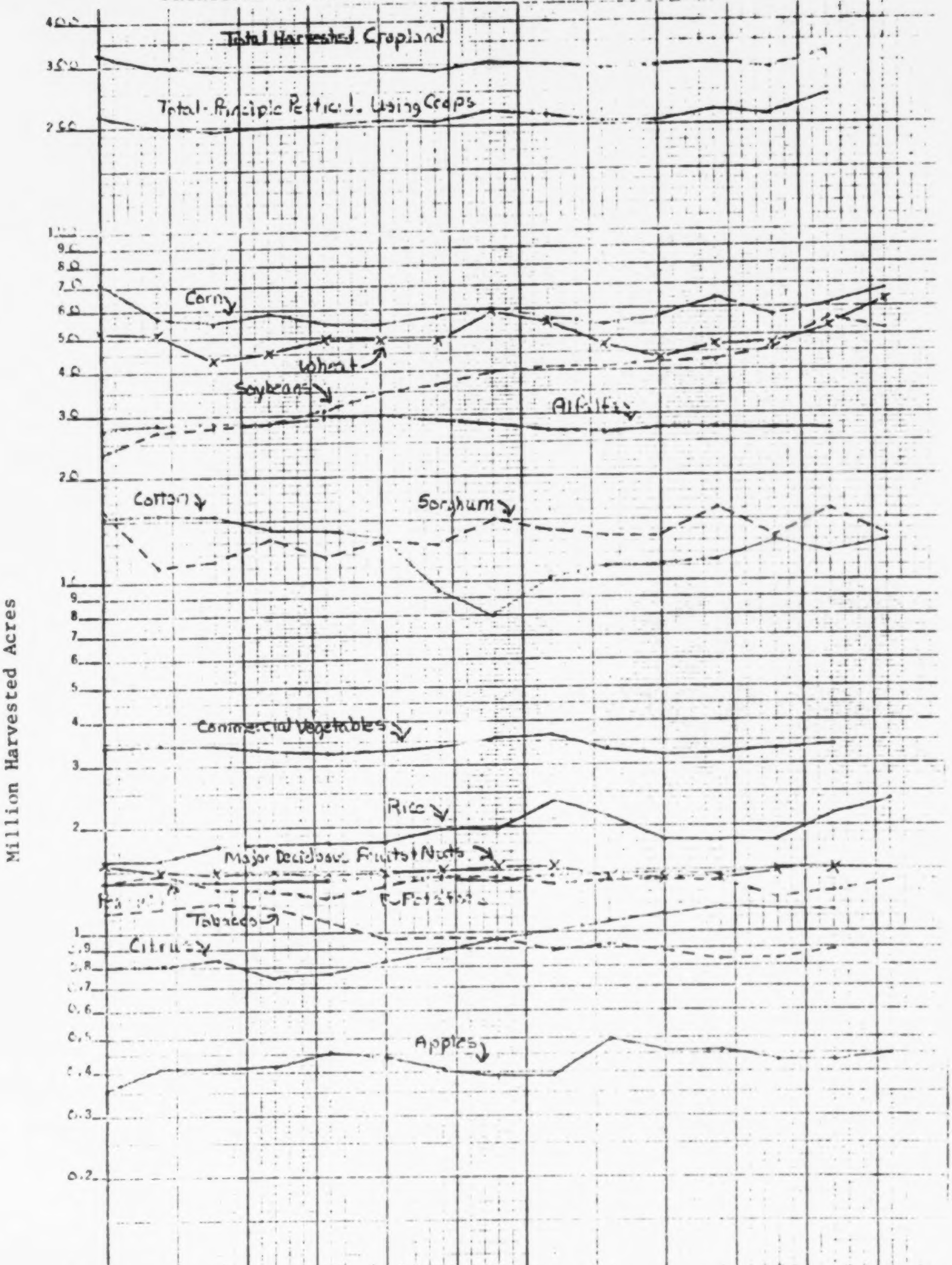

Table 3

Alfalfa Hay

Year	Harvested Acres (M acres)	Production (M tons)	Average Yield per Harvested Acre (tons)	Farm Value	
				Total (MM $)	$ per Harvested Acre
1940	14,023	30,286	2.16	261.4	18.6
1950	19,901	42,673	2.14	985.7	49.5
1960	27,580	67,083	2.43	1,408.7	51.1
1961	28,265	66,946	2.37	1,405.9	49.7
1962	28,257	71,731	2.54	1,535.0	54.3
1963	28,490	70,037	2.46	1,645.9	57.8
1964	29,394	71,304	2.43	1,711.3	58.2
1965	29,705	74,854	2.52	1,796.5	60.5
1966	28,950	73,073	2.52	1,804.9	62.3
1967	27,997	74,260	2.65	1,752.5	62.6
1968	26,964	73,632	2.73	1,693.5	62.8
1969	26,634	75,883	2.85	1,813.6	68.1
1970	27,202	75,447	2.77	1,863.5	68.5
1971	27,539	77,169	2.80	2,091.3	75.9
1972	26,946	77,707	2.88	-	-
1985[f]	30,000[e]	102,300	3.41[t.a.]	-	-
2000[f]	35,000[e]	141,354	4.04[t.a.]		

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f = forecast
e = SRI estimate
p = preliminary
t.a. = linear regresssion trend analysis

Source: SRI Chemical Economic Handbook, USDA Agricultural Statistics, County Agricultural Commission Annual Reports.

Table 3 (continued)

Hay, All (tons)

Year	Harvested Acres (M acres)	Production (M tons)	Average Yield per Harvested Acre (tons)	Farm Value	
				Total (MM $)	$ per Harvested Acre
1930	67,947	74,527	1.10	824.0	12.1
1940	73,058	96,050	1.31	943.2	12.9
1950	75,150	103,820	1.38	2,221.6	29.6
1960	67,313	118,158	1.76	2,410.0	35.8
1961	67,376	116,957	1.74	2,403.9	35.7
1962	67,563	121,759	1.80	2,553.4	37.8
1963	66,428	117,537	1.77	2,716.4	40.9
1964	67,375	118,778	1.76	2,809.1	41.7
1965	67,684	125,536	1.85	2,913.4	43.1
1966	65,140	121,027	1.86	2,892.2	44.4
1967	64,667	126,300	1.95	2,896.9	44.8
1968	62,693	125,522	2.00	2,854.6	45.5
1969	62,053	127,675	2.06	2,984.4	48.1
1970	61,492	126,971	2.06	3,077.5	50.0
1971	61,405	129,119	2.10	3,335.8	54.3
1972	59,821	128,614	2.15	3,749.9	62.7
1973	62,190	134,608	2.16	4,878.9	78.4
1974P	60,500	123,800	2.05	6,276.6	103.7

Table 3 (continued)

Apples

Year	Estimated Bearing Acres (M acres)	Production (M tons)	Value (MM $)
1930	547	3,759	n.a.
1940	389	2,674	n.a.
1950	432	2,970	n.a.
1960	357	2,456	235.4
1961	410	2,817	230.7
1962	414	2,843	243.4
1963	416	2,860	233.0
1964	454	3,120	241.1
1965	437	3,001	259.1
1966	411	2,825	252.6
1967	393	2,703	300.9
1968	396	2,723	332.7
1969	496	3,410	272.3
1970	465	3,198	283.8
1971	464	3,186	299.1
1972	428	2,941	371.5
1973	432	3,109	n.a.
1974^p	449	3,083	n.a.
1985^f	450^e	$3,500^e$	-
2000^f	450^e	$3,800^e$	-

Bearing acres estimated from 1969 Census of Agriculture - Special Survey, 1971.

Table 3 (continued)

Citrus Fruits*

				Farm Value	
Year	Harvested Acres (M acres)	Production (M tons)	Yield (tons)	Total (MM $)	$ per Harvested Acre
1930	494	3,158	6.39	105.6	213.8
1940	767	5,662	7.38	139.4	181.7
1950	815	7,535	9.25	327.5	401.8
1960	798	8,003	10.03	327.0	409.8
1961	807	7,629	9.45	404.2	500.9
1962	838	8,673	10.35	363.9	434.2
1963	775	6,551	8.45	358.4	462.5
1964	781	6,227	7.97	454.9	582.5
1965	832	7,633	9.17	405.5	487.4
1966	877	8,767	10.00	391.1	446.0
1967	939	11,437	12.18	499.5	531.9
1968	1,002	8,329	8.31	605.9	604.7
1969	1,066	11,216	10.52	648.1	608.0
1970	1,120	11,344	10.13	618.8	543.6
1971	1,183	11,935	10.09	734.7	621.0
1972	1,168	12,174	10.42	870.1	744.9
1973	1,179	13,901	11.79	895.3	759.4
1974	-	12,900	-	-	-
1985[f]	1,623[t.a.]	19,000[e]	-	-	-
2000[f]	1,623[e]	19,000[e]	-	-	-

*Oranges, tangelos, tangerines, temples, grapefruit, lemons, limes

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Table 3 (continued)

Corn - Grain

Year	Harvested Acres (M acres)	Production		Average Yield per Harvested Acre (tons)	Farm Value	
		MM bu	M tons		Total (MM $)	$ per Harvested Acre
1930	85,525	1,757.3	49,204	0.574	1,244.3	-
1940	76,443	2,206.9	61,793	0.809	1,518.7	-
1950	72,398	2,764.1	77,395	1.070	4,222.4	58.3
1960	71,422	3,906.9	109,393	1.532	3,928.8	55.0
1961	57,634	3,597.8	100,738	1.747	3,939.0	68.3
1962	55,726	3,606.3	100,976	1.812	4,025.3	72.2
1963	59,227	4,019.2	112,538	1.901	4,454.0	75.2
1964	55,369	3,484.3	97,560	1.761	4,064.2	73.4
1965	55,332	4,084.3	114,360	2.066	4,731.9	85.5
1966	56,933	4,117.4	115,287	2.024	5,105.7	89.7
1967	60,557	4,760.1	133,283	2.201	4,939.7	81.6
1968	55,880	4,393.3	123,012	2.201	4,763.1	65.2
1969	54,598	4,582.5	128,310	2.349	5,289.8	96.9
1970	57,358	4,151.9	116,254	2.027	5,514.4	96.1
1971	64,047	5,641.1	157,951	2.467	6,095.0	95.2
1972	57,421	5,573.3	156,052	2.718	7,017.4	122.2
1973	61,760	5,613.2	158,009	2.559	13,357.4	216.3
1974	63,700	4,621.0	129,388	2.175	15,942.0	250.3
1985[f]	60,000[e]	-	193,800	3.23[t.a.]	-	-
2000[f]	70,000[e]	-	292,600	4.18[t.a.]	-	-

(1 bushel (bu) = 56 lb shelled corn = 0.028 ton)

Table 3 (continued)

Cotton

Year	Harvested Acres (M acres)	Production		Average Yiels per Harvested Acre, Lint (tons)	Farm Value			
							Total	
		Lint (MM bales)	Lint/Seed (M tons)		Lint (MM $)	Seed (MM $)	MM $	$ per Harvested Acre
1930	42,444	13.9	3,336/6,028	0.079	659.0	133.1	792.1	18.7
1940	23,861	12.6	3,024/5,286	0.126	621.3	114.8	736.1	30.8
1950	17,843	10.0	2,400/4,105	0.135	2,005.7	354.6	2,360.3	132.3
1960	15,309	14.3	3,432/5,886	0.223	2,154.2	250.0	2,404.2	157.0
1961	15,634	14.3	3,432/5,978	0.219	2,356.3	305.3	2,661.6	170.2
1962	15,569	14.9	3,576/6,139	0.229	2,370.5	293.8	2,664.3	171.1
1963	14,212	15.3	3,672/6,192	0.259	2,469.6	314.2	2,783.8	195.9
1964	14,055	15.2	3,648/6,237	0.259	2,258.5	293.4	2,551.9	181.6
1965	13,615	15.0	3,600/6,087	0.264	2,106.1	284.4	2,390.5	175.6
1966	9,552	9.6	2,304/3,960	0.240	997.5	261.0	1,258.5	131.8
1967	7,997	7.5	1,800/3,210	0.224	953.8	177.4	1,131.2	141.5
1968	10,160	10.9	2,616/4,640	0.258	1,212.0	234.5	1,446.5	142.4
1969	11,058	10.0	2,400/4,186	0.217	1,055.0	167.2	1,222.2	110.5
1970	11,155	10.2	1,446/4,068	0.105	1,121.6	229.6	1,351.2	121.1
1971	11,471	10.5	2,514/4,244	0.105	1,419.6	241.1	1,660.7	144.8
1972	12,983	13.7	3,288/5,440	0.253	1,743.7	270.5	2,014.2	155.1
1973	11,995	13.0	3,120/5,216	0.260	2,776.3	520.5	3,296.8	275.0
1974	13,072	12.8	3,075/5,231	0.235	2,761.5	567.6	3,329.1	255.7
1985[f]	11,500[e]	-	2,875[e]	0.25[e]	-	-	-	-
2000[f]	11,500[e]	-	2,875[e]	0.25[e]	-	-	-	-

(Lint: 1 bale = 480 lb net = 0.240 ton)

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Table 3 (continued)

Peanuts (pounds)

Year	Harvested Acres (M acres	Production MM lb	Production M tons	Average Yield per Harvested Acre (tons)	Farm Value Total (MM $)	Farm Value $ per Harvested Acre
1930	1,073	697.4	349	0.325	24.5	22.8
1940	2,052	1,766.6	883	0.431	58.9	28.7
1950	2,262	2,035.3	1,018	0.450	221.9	98.1
1960	1,395	1,718.0	859	0.616	172.0	123.3
1961	1,398	1,657.1	829	0.593	181.5	129.8
1962	1,400	1,719.3	860	0.614	189.3	135.2
1963	1,396	1,942.1	971	0.696	217.8	156.0
1964	1,397	2,099.1	1,050	0.751	235.0	168.2
1965	1,435	2,384.0	1,192	0.831	272.2	189.7
1966	1,418	2,410.4	1,205	0.850	217.7	153.5
1967	1,402	2,473.4	1,237	0.883	282.7	201.6
1968	1,436	2,542.8	1,271	0.886	302.3	210.5
1969	1,448	2,528.7	1,264	0.872	311.3	215.0
1970	1,467	2,979.5	1,490	1.016	382.5	260.7
1971	1,454	3,005.1	1,503	1.033	408.4	280.9
1972	1,487	3,274.8	1,637	1.101	477.5	321.1
1973	1,496	3,473.8	1,737	1.162	562.8	376.2
1974	1,492	3,456.2	1,728	1.158	615.2	412.3
1985[f]	1,576[t.a.]	-	2,463	1.563[t.a.]	-	-
2000[f]	1,694[t.a.]	-	3,727	2.20[t.a.]	-	-

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Table 3 (continued)

Potatoes (Irish)

Year	Harvested Acres (M acres)	Production MM Cwt	Production M tons	Average Yield per Harvested Acre (tons)	Farm Value Total (MM $)	Farm Value $ per Harvested Acre
1930	3,139	206.3	10,315	3.29	312.5	99.6
1940	2,832	226.2	11,310	3.40	198.1	70.0
1950	1,698	259.1	12,955	7.63	394.4	232.3
1960	1,386	257.1	12,855	9.25	513.4	370.4
1961	1,480	293.2	14,660	9.90	399.7	270.1
1962	1,347	264.8	13,240	9.85	441.1	327.5
1963	1,323	271.2	13,560	10.25	482.6	364.8
1964	1,272	241.1	12,055	9.50	846.0	665.1
1965	1,384	291.2	14,560	10.50	730.8	528.0
1966	1,464	306.9	15,345	10.50	619.8	423.4
1967	1,457	305.3	15,265	10.50	565.8	388.3
1968	1,378	294.2	14,710	10.70	652.7	473.7
1969	1,413	311.9	15,595	11.05	694.0	491.2
1970	1,421	325.8	16,288	11.45	714.9	503.1
1971	1,391	319.4	15,968	11.50	603.0	433.5
1972	1,254	296.0	14,724	11.70	751.2	599.0
1973	1,304	299.4	14,970	11.50	1,196.6	918.3
1974	1,385	337.8	16,888	12.15		
1985^{f}	1,400^{e}	-	19,530	13.95$^{t.a.}$		
2000^{f}	1,600^{e}	-	20,720	16.70$^{t.a.}$		

(1 hundredweight (Cwt) = 100 lb = 0.050 ton)

Table 3 (continued)

Rice (rough)

Year	Harvested Acres (M acres)	Production		Average Yield per Harvested Acre (tons)	Farm Value	
		M Cwt	M tons		Total (MM $)	$ per Harvested Acre
1930	966	20,218	1,011	1,047	35.2	36.4
1940	1,069	24,495	1,225	1.146	44.2	41.3
1950	1,637	38,820	1,941	1.186	197.4	120.6
1960	1,595	54,591	2,730	1.712	248.4	155.7
1961	1,589	54,198	2,710	1,706	278.6	175.3
1962	1,773	66,045	3,302	1,863	332.6	187.6
1963	1,771	70,269	3,513	1,984	352.2	198.9
1964	1,786	73,166	3,658	2,049	358.6	200.8
1965	1,793	76,281	3,814	2,128	376.2	209.8
1966	1,967	85,020	4,251	2,161	421.0	214.0
1967	1,970	89,379	4,469	2.269	444.0	225.4
1968	2,353	104,075	5,204	2.211	520.9	221.4
1969	2,128	90,838	4,542	2.134	449.9	211.4
1970	1,815	83,805	4,190	2.309	433.2	238.7
1971	1,818	85,768	4,288	2.359	457.7	251.8
1972	1,818	85,439	4,272	2.350	561.7	309.0
1973	2,170	92,823	4,641	2.138	1,312.4	604.7
1974	2,380	111,000	5,550	-	-	-
1985^{f}	$2,400^{e}$	-	7,032	$2.93^{t.a.}$	-	-
2000^{f}	$3,000^{e}$	-	10,800	$3.60^{t.a.}$	-	-

(1 hundredweight (Cwt) = 100 lb = 0.050 ton)

Table 3 (continued)

Sorghum - Grain

Year	Harvested Acres (M acres)	Production MM bu	Production M tons	Average Yield per Harvested Acre (tons)	Farm Value Total (MM $)	Farm Value $ per Harvested Acre
1930	3,477	37.6	1,053	0.302	20.8	6.0
1940	6,374	95.8	2,682	0.378	41.0	6.4
1950	10,346	233.5	6,538	0.633	245.3	23.7
1960	15,601	620.0	17,360	1.112	514.9	33.0
1961	10,985	480.2	13,446	1.224	483.1	44.0
1962	11,571	510.3	14,288	1.235	516.5	44.6
1963	13,326	585.4	16,391	1.229	567.8	42.6
1964	11,742	489.8	13,714	1.168	512.0	43.6
1965	13,029	672.7	18,836	1.445	668.0	51.3
1966	12,813	715.0	20,020	1.562	738.9	57.7
1967	14,999	755.9	21,165	1.411	744.7	49.6
1968	13,995	739.7	20,712	1.481	699.2	50.0
1969	13,525	747.3	20,924	1.548	791.2	58.5
1970	13,568	683.6	19,140	1.411	780.1	57.5
1971	16,301	875.8	24,521	1.504	910.4	55.8
1972	13,368	809.3	22,660	1.695	1,041.3	77.9
1973	15,940	936.6	26,224	1.646	1,995.9	125.2
1974	13,600	609.0	17,052	1.257	3,520.0	258.8
1985[f]	15,000[e]	-	27,000[e]	1.8[e]	-	-
2000[f]	18,000[e]	-	36,000[e]	2.0[e]	-	-

(1 bushel (bu) = 56 lb = 0.028 ton)

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Table 3 (continued)

Soybeans - For Beans

Year	Harvested Acres (M acres)	Production MM bu	Production M tons	Average Yield per Harvested Acre (tons)	Farm Value Total (MM $)	Farm Value $ per Harvested Acre
1930	1,074	13.9	417	0.390	19.1	17.8
1940	4,807	78.0	2,340	0.486	70.2	14.6
1950	13,807	299.2	8,976	0.651	737.8	53.4
1960	23,655	555.1	16,653	0.705	1,184.9	50.1
1961	27,003	678.6	20,358	0.753	1,543.9	57.2
1962	27,608	669.2	20,076	0.726	1,564.4	56.7
1963	28,615	699.2	20,976	0.732	1,755.1	61.3
1964	30,793	700.9	21,027	0.684	1,836.4	59.6
1965	34,449	845.6	25,368	0.735	2,151.3	62.4
1966	36,546	928.5	27,855	0.762	2,553.4	69.9
1967	39,767	976.1	29,283	0.735	2,432.6	61.2
1968	41,104	1,103.1	33,093	0.804	2,679.2	65.2
1969	40,982	1,126.3	33,789	0.825	2,647.5	64.6
1970	42,249	1,127.1	33,813	0.801	3,214.7	76.1
1971	42,701	1,176.0	35,780	0.825	3,538.5	82.9
1972	45,698	1,270.6	38,118	0.834	4,451.8	97.4
1973	56,416	1,566.5	46,995	0.834	6,845.6	121.3
1974[p]	52,410	1,315.8	39,474	0.753	9,631.7	183.8
1985[f]	68,000[e]	-	63,240[e]	0.93[e]	-	-
2000[f]	70,000[e]	-	70,000[e]	1.00[t.a.]	-	-

(1 bushel (bu) = 60 lb = 0.030 ton)

Table 3 (continued)

Tobacco (pounds (lb))

Year	Harvested Acres (M acres)	Production		Average Yield per Harvested Acre (tons)	Farm Value	
		Units (MM lb)	M tons		Total (MM $)	$ per Harvested Acre
1930	2,124	1,648.0	824	0.388	210.9	99.3
1940	1,410	1,460.4	730	0.518	234.5	166.3
1950	1,599	2,029.6	1,015	0.635	1,048.5	655.7
1960	1,142	1,944.2	972	0.852	1,183.8	1,036.6
1961	1,174	2,061.4	1,031	0.878	1,314.9	1,120.0
1962	1,224	2,314.8	1,157	0.946	1,363.8	1,114.2
1963	1,176	2,343.8	1,172	0.997	1,352.1	1,149.7
1964	1,078	2,227.9	1,114	1.034	1,317.9	1,222.5
1965	977	1,854.6	927	0.949	1,206.7	1,235.1
1966	974	1,886.8	943	0.969	1,252.9	1,286.2
1967	960	1,967.9	984	1.025	1,315.5	1,370.3
1968	880	1,710.4	855	0.972	1,188.6	1,350.7
1969	920	1,804.2	902	0.981	1,295.8	1,408.5
1970	898	1,906.5	953	1.061	1,389.3	1,547.1
1971	839	1,707.6	854	1.017	1,340.6	1,597.8
1972	842	1,749.3	874	1.038	1,442.8	1,713.5
1973	892	1,783.0	891	0.991	1,682.1	1,773.6
1985[f]	900[e]	-	900[e]	1.0[e]	-	-
2000[f]	900[e]	-	1,080[e]	1.2[e]	-	-

Table 3 (continued)

Wheat

Year	Harvested Acres (M acres)	Production MM bu	Production M tons	Average Yield per Harvested Acre (tons)	Farm Value Total (MM $)	Farm Value $ per Harvested Acre
1930	62,637	886.5	26,595	0.426	595.2	9.5
1940	53,273	814.6	24,438	0.459	555.5	10.4
1950	61,607	1,019.3	30,579	0.495	2,042.3	33.2
1960	51,879	1,354.7	40,641	0.783	2,361.2	45.5
1961	51,571	1,232.4	36,972	0.717	2,254.7	43.7
1962	43,688	1,092.0	32,760	0.750	2,225.7	50.9
1963	45,506	1,146.8	34,404	0.756	2,125.3	46.7
1964	49,762	1,283.4	38,502	0.774	1,757.0	35.3
1965	49,560	1,315.6	39,468	0.795	1,774.5	35.8
1966	49,867	1,311.7	39,351	0.789	2,140.7	42.9
1967	58,771	1,522.4	45,672	0.777	2,110.2	35.9
1968	55,262	1,576.3	47,289	0.855	1,950.5	35.3
1969	47,577	1,460.2	43,806	0.921	1,815.7	38.2
1970	43,564	1,351.6	40,547	0.930	1,802.3	41.4
1971	47,674	1,617.8	48,534	1.017	2,164.4	45.4
1972	47,284	1,544.8	46,343	0.981	2,595.1	54.4
1973	53,875	1,711.4	51,340	0.954	6,500.7	120.7
1974[p]	63,700	1,780.6	53,418	0.907	-	-
1985[f]	65,000[e]	-	72,800[e]	1.12[t.a.]	-	-
2000[f]	65,000[e]	-	91,000[e]	1.40[t.a.]	-	-

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(1 bushel (bu) = 60 lb = 0.030 ton)

Table 3 (continued)

Commercial Vegetables and Melons (tons)

	FRESH MARKET				PROCESSING			
			Farm Value				Farm Value	
Year	Harvested Acres (M acres)	Production (M tons)	Total (MM $)	$ per Harvested Acre	Harvested Acres (M acres)	Production (M tons)	Total (MM $)	$ per Harvested Acre
1930	-	-	-	-	-	-	-	-
1940	1,861	7,405	239.2	128.5	1,400	4,018	68.8	49.1
1950	2,149	10,029	630.3	260.6	1,574	5,175	203.4	129.2
1960	1,816	11,025	837.5	461.2	1,568	7,373	287.2	183.2
1961	1,740	10,683	873.9	502.2	1,718	8,170	336.2	195.7
1962	1,700	10,679	905.0	532.4	1,715	9,357	362.4	211.3
1963	1,703	10,998	912.8	536.0	1,605	8,022	320.7	199.8
1964	1,669	10,620	961.5	576.1	1,605	8,135	349.4	217.7
1965	1,646	10,991	1,017.9	618.4	1,645	8,457	405.9	246.7
1966	1,617	10,730	1,137.0	703.2	1,807	8,940	433.4	239.8
1967	1,635	11,127	1,151.2	704.1	1,940	9,975	530.4	273.4
1968	1,636	11,293	1,188.0	726.2	2,012	12,094	599.8	298.1
1969	1,629	11,083	1,248.2	766.2	1,717	9,382	451.3	262.8
1970	1,592	11,236	1,205.6	757.4	1,606	9,365	442.3	275.5
1971	1,613	11,268	1,438.0	891.5	1,638	10,006	478.7	292.3
1972	1,651	11,721	1,605.3	972.3	1,668	10,331	470.0	281.8
1973	1,637	11,989	1,839.8	1,123.9	1,789	10,384	589.4	243.9
1974					1,884			

Continued -

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Table 3 (continued)

Commercial Vegetables and Melons (continued)

Year	ADD TOTAL		
	Harvested Acres (M acres)	Production (M tons)	Farm Value (MM $)
1930	-	-	-
1940	3,261	11,423	308.0
1950	3,723	15,204	833.7
1960	3,384	18,398	1,124.7
1961	3,458	18,853	1,210.1
1962	3,415	20,036	1,267.4
1963	3,308	19,020	1,233.5
1964	3,274	18,755	1,310.9
1965	3,291	19,448	1,423.8
1966	3,424	19,670	1,570.4
1967	3,575	21,102	1,681.6
1968	3,648	23,387	1,787.8
1969	3,346	20,465	1,699.5
1970	3,198	20,601	1,647.9
1971	3,251	21,274	1,916.7
1972	3,319	22,052	2,075.3
1973	3,426	22,373	2,429.2
1985[f]	3,500[e]	25,877[t.a.]	-
2000[f]	3,500[e]	30,308[t.a.]	-

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Table 3 (continued)

Tree Fruits and Nuts

	MAJOR DECIDUOUS FRUITS			MINOR FRUITS		
Year	Harvested Acres (M acres)	Production (M tons)	Farm Value (MM $)	Harvested Acres (M acres)	Production (M tons)	Farm Value (MM $)
1930	4,201	-	-	83	99	-
1940	2,742	8,175	204.9	87	211	10.8
1950	2,191	8,486	610.4	81	181	31.1
1960	1,682	8,809	737.1	88	235	34.0
1961	1,668	9,526	763.9	89	243	33.0
1962	1,677	9,547	767.2	89	256	39.2
1963	1,669	9,647	769.2	89	266	39.6
1964	1,669	10,223	834.0	90	263	40.1
1965	1,670	10,553	792.1	86	263	40.6
1966	1,656	9,841	849.7	84	306	49.9
1967	1,652	8,476	916.4	83	188	41.4
1968	1,660	9,586	1,017.4	82	303	71.0
1969	1,657	10,808	976.1	80	289	65.4
1970	1,576	9,475	965.0	81	238	60.3
1971	1,548	10,163	1,065.9	83	237	57.7
1972	1,538	8,031	1,176.6	85	257	78.2
1973	1,533	10,419	1,761.3	86	226[p]	61.4[p]

	TREE NUTS		
Year	Harvested Acres (M acres)	Production (M tons)	Farm Value (MM $)
1930	179	-	-
1940	223	130	28.4
1950	259	171	83.2
1960	250	229	128.8
1961	248	273	119.1
1962	251	173	96.9
1963	253	338	146.0
1964	260	263	132.7
1965	263	287	128.2
1966	273	274	147.4
1967	284	277	168.9
1968	292	274	182.2
1969	304	348	189.3
1970	321	322	191.0
1971	347	405	230.5
1972	381	344	246.8
1973	400	444	405.2
1985[f]	-	-	-
2000[f]	-	-	-

Table 3 (continued)

Tree Fruits and Nuts (continued)

Year	ADD TOTAL Harvested Acres (M acres)	Production (M tons)	Farm Value (MM $)
1930	4,957	-	-
1940	3,819	14,178	383.5
1950	3,346	16,373	1,052.2
1960	2,818	17,276	1,226.9
1961	2,812	17,671	1,320.2
1962	2,855	18,649	1,269.2
1963	2,786	16,802	1,313.2
1964	2,800	16,976	1,461.7
1965	2,851	18,736	1,366.4
1966	2,890	19,188	1,438.1
1967	2,958	20,378	1,626.2
1968	3,036	18,492	1,876.5
1969	3,107	22,661	1,878.9
1970	3,194	21,767	1,983.3
1971	3,255	23,128	2,249.3
1972	3,259	21,058	2,532.8
1973	3,281	25,369	3,312.1
1985[f]	3,600[e]	-	-
2000[f]	4,000[e]	-	-

Table 3 (continued)

Berries

Year	Harvested Acres (M acres)	Production (M tons)	Farm Value (MM $)
1930	-	-	-
1940	192	256	38.0
1950	152	246	88.4
1960	126	348	116.9
1961	130	355	112.2
1962	130	369	120.5
1963	122	363	126.8
1964	120	391	147.8
1965	116	355	139.8
1966	117	374	149.1
1967	114	362	135.2
1968	109	381	153.7
1969	101	388	165.8
1970	96	388	148.2
1971	94	388	160.5
1972	87	252	161.1
1973	83	377	188.9
1974^p			

Table 3 (concluded)

TOTAL UNITED STATES

Year	Add Total of Listed Crops	
	Harvested Acres (MM acres)	Farm Value (Billion $)
1930	-	-
1940	345.0	6.0
1950	340.4	17.7
1960	318.9	19.0
1961	297.7	19.8
1962	289.2	20.3
1963	293.2	21.2
1964	293.7	20.9
1965	294.4	21.9
1966	288.0	22.1
1967	304.0	22.0
1968	298.8	22.7
1969	290.4	23.1
1970	294.1	24.2
1971	302.0	26.6
1972	290.6	30.2
1973	322.3	
1985[f]	350[e]	
2000[f]	375[e]	

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f = forecast
e = SRI estimate
p = preliminary
t.a. = linear regression trend analysis

SC=

- Harvested acreage

  Increasing: citrus, corn, soybeans, wheat
  Decreasing: tobacco
  Static*: all others and total U.S. cropland harvested

- Yield per harvested acre

  Increasing: alfalfa, corn, peanuts, potatoes, sorghum, soybeans, wheat
  Decreasing: none
  Static: apples, citrus, cotton, rice, tobacco, vegetables, fruits and nuts**

- $ per harvested acre

  Increasing: alfalfa, corn, cotton, peanuts, potatoes, rice, sorghum, soybeans, tobacco, wheat, vegetables
  Decreasing: none
  Static: apples, citrus, deciduous fruits and nuts

It should be emphasized that dollar per harvested acre reflects gross returns without consideration of the changes in costs to produce that return. From the farmers' viewpoint, net returns are what is important, and historically, demand and supply have adjusted to keep the net returns relatively low and constant over time. Therefore, the relative productivity of the different inputs is probably the more dominant factor affecting demand for pest control over the long run, whereas, radical changes in gross return per acre (such as in 1973 and 1974) have a more influential effect on demand for pest control in the short run.

On the cost side, we have described the effects of changing levels of direct expenses on the substitution and use of inputs. An increasingly important factor in the cost segment exhibiting pressure for increased usage of pesticides is the rapidly rising level of fixed or capital costs incurred per unit of production. The significant components of fixed costs include: land costs, machinery and building costs, interest (both working capital and long-term debt), taxes and insurance.

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*Static implies either no trend discernible and/or wide yearly fluctuations.

**Citrus, deciduous fruits and nuts have a tendency to alternate bearing without any real discernible trend in yield. The trend in yields is most probably upward due to new plantings, closer spacing, and better cultural practices.

As the absolute value of the so-called fixed costs increases per acre, there is a shift toward higher value crops and tremendous pressure to increase productivity per acre by increasing yield, reducing costs, and/or using pesticides as insurance. In 1973, the input category changing the most was the miscellaneous category which went up 7 percent. Pesticides were responsible for a significant portion of this increase. The second largest increase in input expenses in 1973 was real estate, up 4 percent, reflecting increasing interest payments and increasing land values; taxes and interest group also increased 4 percent.

Fixed costs can be divided into two categories: (1) those that are fixed to the unit (acre) of production itself, such as taxes and mortgage interest, and (2) those that are not fixed to the unit of production, such as machinery, equipment, buildings, management. The latter category of fixed expense can exhibit tremendous economies of scale by being spread over a larger number of production units. The so-called economies of scale greatly reduces the per unit allocation of these fixed costs, and has been and will continue to be a stimulus toward expansion of existing farms. As farms expand, the level of management sophistication concurrently rises, and input optimization--which includes decisions about pesticide usage--becomes an increasingly closely scrutinized part of the farm operation.

It is reasonable to expect that the trend toward fewer numbers of larger farms also brings with it a more sophisticated grower in terms of the analysis of input alternatives, and a subsequent increase in the amounts of pesticides used.* The implications of this will be more thoroughly examined in the discussion of the demand for pest control.

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*USDA. "Quantities of Pesticides Used by Farmers in 1966," ERS, AER. No. 179.

Saturation Levels

Although time-series trend data is not available, it is important to examine the proportion of farmers growing the crops identified as pesticide-using who actually use pesticides. Obviously. there is a saturation level or upper bound where 100 percent of all farmers growing a particular crop use a pesticide. From the most recently available data and a private communication with the USDA, Tables 4A and 4B were constructed to exhibit how close to saturation use levels the actual amounts of pesticides for the selected crops were in 1971 in comparison to 1966. One must keep in mind that the quantity of pesticides used is also a function of the absolute number of acres planted in each crop, the number of applications and the dosage rates.

Further, it must be noted that while the percentage of acreage planted for the 1966-1971 period remains relatively constant there is a dramatic rise in the total sales in pounds of synthetic organic pesticides and a concomitant increase in the percentage of acreage treated. (See Table 4A.) In conversations with USDA personnel, we gleaned that forthcoming publications will elaborate on the extent of use of pesticides by class in 1971 on a percentage-of-acreage basis. In addition, new surveys are anticipated which the EPA could use to amend and update Tables 4A and 4B.

Projections

Projections of crop acreages, yields, and production for the years 1985 and 2000 were made based on linear trend analyses, intuitive reasoning and comparative analyses with similar projections made by other agencies and organizations (USDA, FAO, MRI, etc.). The projections should be viewed as one plausible, consistent scenario estimating the

Table 4A

NUMBER OF FARMERS GROWING CROPS IN 1969, PERCENTAGE REPORTING PESTICIDES USED IN 1971, AND PERCENTAGE OF ACREAGE TREATED IN 1966, BY TYPES OF PEST CONTROL AND CROP

Crop	Farmers Growing Crops in 1969[1] (1000)	Weeds		Insects & Soil Organisms		Diseases		Other[5]	
		Percentage of Farmers[2]	Percentage of Acres[3]	Percentage of Farmers	Percentage of Acres	Percentage of Farmers	Percentage of Acres	Percentage of Farmers	Percentage of Acres
Alfalfa	639[4]	2	< 0.5	6	7	1	--	< 0.5	--
Apples	31[4]	20	16	82	92	55	72	19	28
Citrus	29[4]	21	29	64	97	36	73	42	38
Corn	1,085	67	57	19	33	1	< 0.5	2	--
Cotton	200	79	52	52	54	2	2	27	26
Peanuts	48	81	63	80	70	68	35	< 0.5	< 0.5
Potatoes (Irish)	92[4]	36	59	65	89	44	24	14	9
Rice	9	91	52	17	10	--	--	1	--
Sorghum	183	41	30	25	2	< 0.5	--	< 0.5	--
Soybeans	530	61	27	4	4	< 0.5	< 0.5	< 0.5	--
Tobacco	276	8	2	74	81	4	7	78	69
Wheat	584	20	28	3	2	< 0.5	< 0.5	< 0.5	--
Vegetables	101	29	28	56	56	24	20	< 0.5	< 0.5
Deciduous Fruits and Nuts	92	26	16	58	63	42	45	4	4
Pasture	1,924[4]	5	1	< 0.5	< 0.5	--	--	< 0.5	--

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[1] 1969 Census of Agriculture.

[2] USDA. "Farmers' Use of Pesticides in 1971...Quantities." ERS, AER No. 252.

[3] USDA. "Extent of Farm Pesticide Use on Crops in 1966." ERS, AER No. 147.

[4] USDA estimates.

[5] Defoliants, dessicants, growth regulators, miticides and rodenticides.

Table 4B

EXTENT OF USE FOR ALL PESTICIDES USED ON SPECIFIED CROPS: UNITED STATES, 1966 AND 1971

	Percentage of Farms Reporting Pesticide Use		Percentage of Acreage Treated With Pesticides	
Crop	1966	1971	1966	1971
Alfalfa	10	7	8	9
Apples	67	84	93	92
Citrus	73	67	97	92
Corn	49	68	67	83
Cotton	63	86	74	90
Peanuts	66	86	77	96
Potatoes (Irish)	65	78	96	88
Rice	74	91	59	93
Sorghum	31	52	31	63
Soybeans	29	63	30	72
Tobacco	81	90	91	90
Wheat	16	23	30	47
Vegetables	56	69	73	74
Other deciduous fruits*	80	84	77	90
Other fruits and nuts†	53	66	65	79
Pasture	5	5	1	1
Total or average, excluding other hay and pasture	-	-	36	52

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*Peaches, pears, cherries, apricots, plums, prunes, nectarines.

†Grapes, avocados, figs, blackberries, blueberries, boysenberries, currants, gooseberries, loganberries, respberries, strawberries, almonds, filberts, pecans, walnuts, olives, tung nuts.

Source: USDA private communication.

future parameters of food and fiber supply trends.

The important conclusion to be drawn from the projections is that for the high pesticide using crops, it is reasonable to assume that acreages of the crops will not decrease significantly, but in most instances will increase. The yield per acre and the crop value per acre will undoubtedly also continue to increase, as will the cost of production--both variable and fixed. Consequently demand for pest control will not slacken and will probably increase.

It is important here to differentiate between the demand for pest control and the demand for the mechanisms of pest control. In the past, the demand for pest control has been defined by the consumption (usage) of pesticide materials, measured in pounds. In the future, while the demand for pest control *per se* should increase, the composition of demand for pest control may change considerably. This will be further elaborated upon in the next section.

Demand for Pest Control

In economic terms, the demand for pest control is a function of the productivity of pest control measures. Such productivity is measured in terms of the potential damage (quantity and quality) to the crop, the unit price of the crop, and the cost-effectiveness of the control measure. In analyzing demand for pest control, we are forced to rely heavily on an expost examination of historical usage patterns to reasonably define and project significant trend factors. Unfortunately, it is virtually impossible to accurately define pesticide production functions for a specific crop except at highly aggregated levels which are virtually meaningless for projecting demand for specific pesticides. This problem is accentuated because pesticide use data are seldom field specific or correlated with yields, and pest problems are highly dynamic.

To complicate the matter further, there is no really good data which estimates losses attributable to pests other than a relatively old and crude estimate made by the USDA in 1965.* Even these data are too generalized to give a meaningful picture of what is happening to the individual grower; also, there is a marked difference in the degree and severity of pest problems from one season to the next and from one region to another. Furthermore, projected estimates of crop losses are complicated by environmental or ecosystem interactions of the pests which are not subject to elaborate quantification.

Historically, the graph in Figure 2 illustrates how the usage of pesticides in the United States (as defined by estimated domestic sales of synthetic organic pesticides and the USDA use surveys) has rapidly increased over the last 14 years in the period from 1960-1973 while the total harvested acres of cropland have increased only slightly. Figure 3 illustrates that herbicides are the largest and fastest growing (~ 5% per year) component of pesticide use while insecticides are growing slowly (~ 0.5 - 1.5% per year) and fungicides have remained at relatively static levels of usage and growth (~ 0 - 0.5% per year).

Even when we look at the time series data on the harvested acreage of the 15 principal pesticide using crops (Table 1), we note that there has not been a significant increase in acreage from 1960-1974, and yet the pounds of pesticides used have increased substantially. Table 5 illustrates how the ratio of pounds of pesticides applied per acre of harvested cropland has tripled since 1960. The correlation between the domestic sales of pesticides in pounds and the farm value in dollars of the crops harvested off these acres is an R^2 of 0.88 which lends credence to the postulation that pesticide use tends to increase as the farm value of the crop increases. To explain the increasing pesticide load over time for these crops, we separate the pesticide poundage figures into the component parts and analyze, in general, the different classes of the pesticides: insecticides, herbicides, fungicides. One must continue to bear in mind that pounds is

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*USDA, "Losses in Agriculture," ARS, Agricultural Handbook No. 291.

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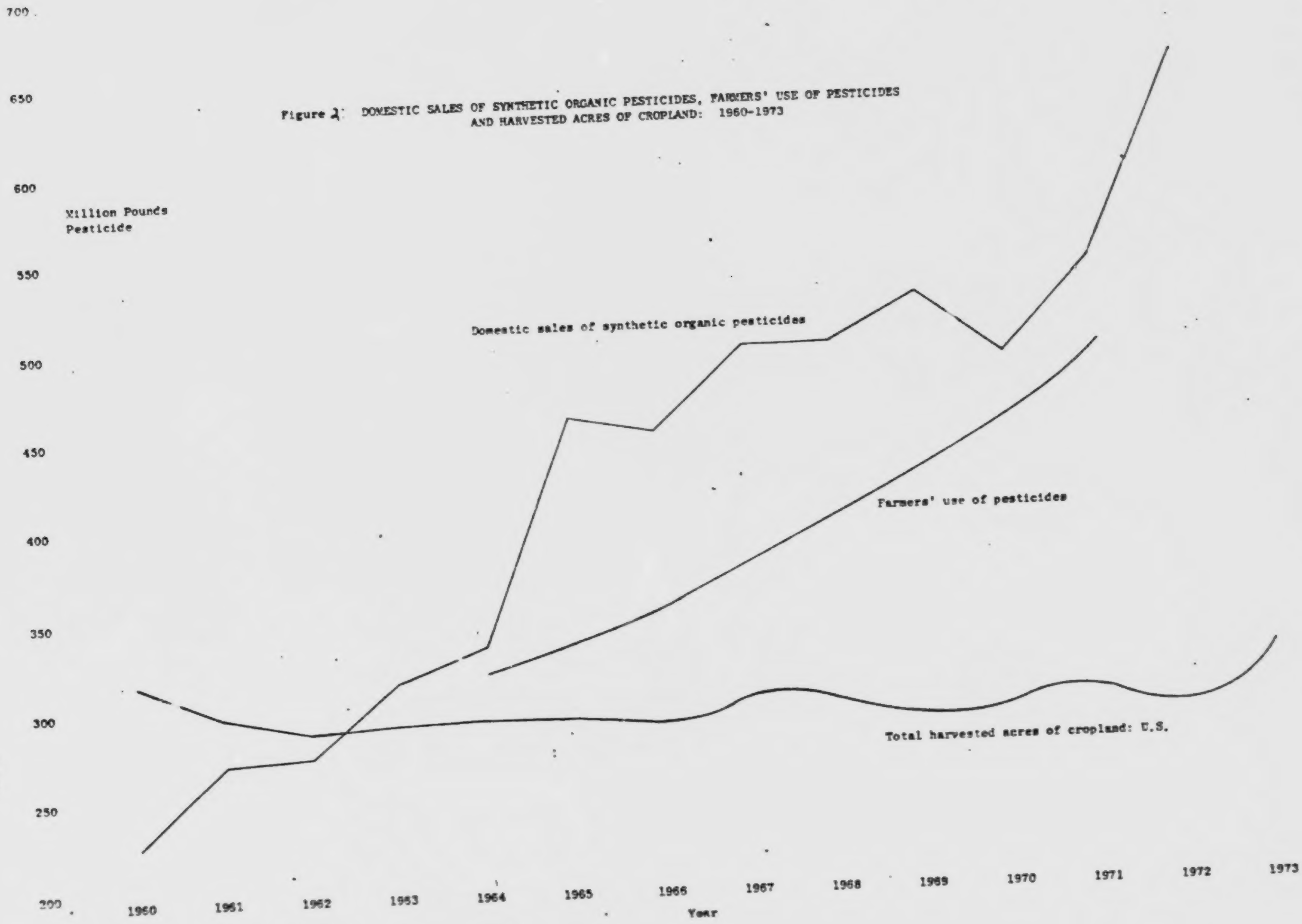
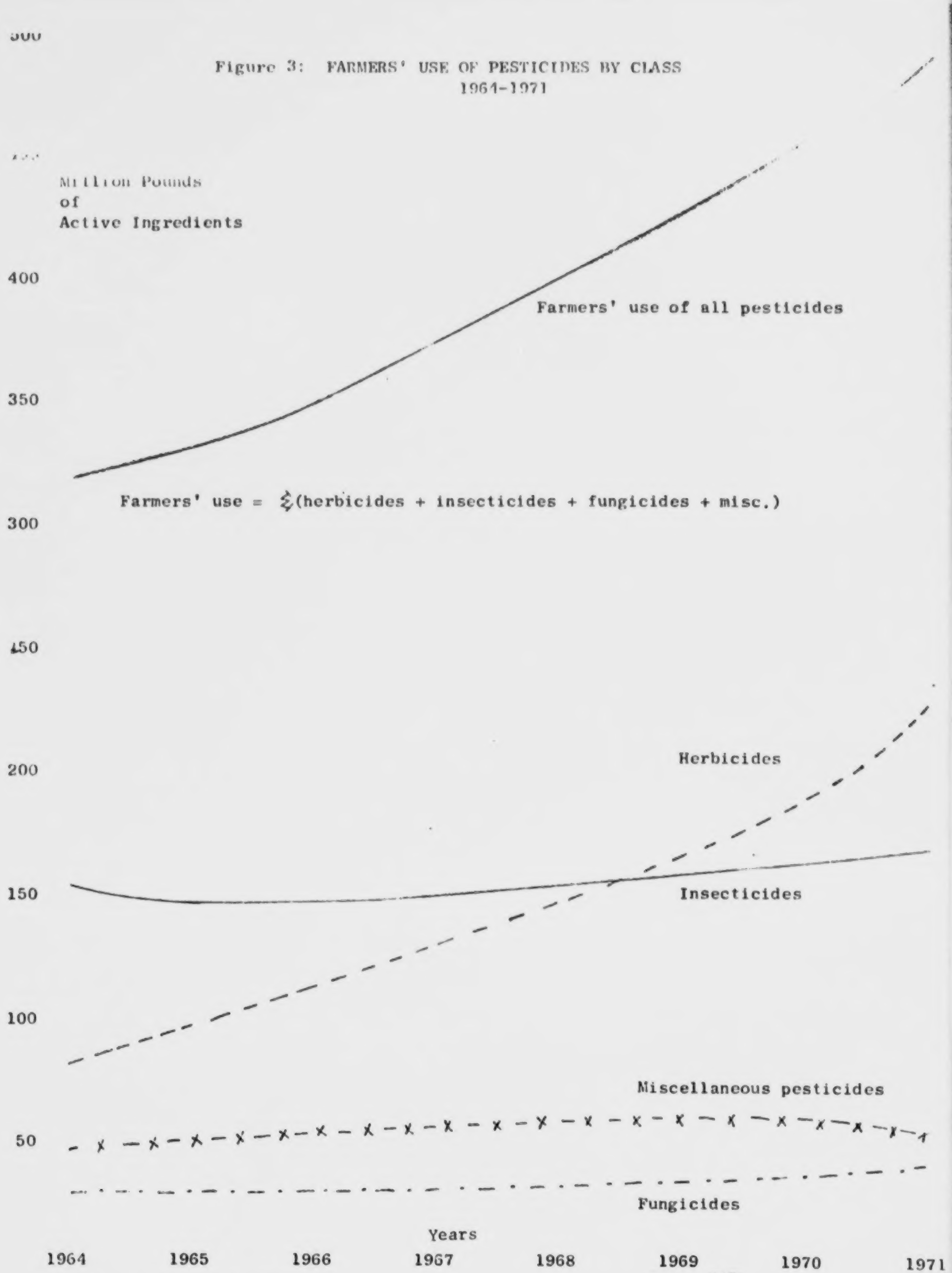
Figure 2: DOMESTIC SALES OF SYNTHETIC ORGANIC PESTICIDES, FARMERS' USE OF PESTICIDES AND HARVESTED ACRES OF CROPLAND: 1960-1973



Source: U.S. Tariff Commission; ASCS; SRI

Figure 3: FARMERS' USE OF PESTICIDES BY CLASS
1964-1971



Source: USDA; ERS; SRI.

Table 5

RELATIONSHIP BETWEEN DOMESTIC SALES OF SYNTHETIC ORGANIC PESTICIDES (LBS.), HARVESTED ACRES OF CROPLAND, AND FARM VALUE ($)

Year	Harvested Acres (MM Acres)	Domestic Sales SOP[1/] (MM Lbs)	Ratio (3) ÷ (2)	Farm Value (Billion $)
1973	322.3			
1972	290.6	656.7	2.26	30.2
1971	302.0	544.5	1.80	26.6
1970	294.1	490.0	1.67	24.2
1969	290.4	526.5	1.81	23.1
1968	298.8	501.1	1.68	22.7
1967	304.0	498.4	1.64	22.0
1966	288.0	452.6	1.57	22.1
1965	294.4	461.3	1.57	21.9
1964	293.7	334.0	1.14	20.9
1963	293.2	315.8	1.08	21.2
1962	289.2	274.5	0.95	20.3
1961	297.7	272.2	0.91	19.8
1960	318.9	228.3	0.72	19.0

[1/] SOP = synthetic organic pesticides.

Source: USDA; ERS; SRI.

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presently the best measure of pesticide use; however, when new control measures are utilized in the future pounds may not be an accurate measure for quantifying the methods employed for controlling agricultural pests.

Even using pounds as a measure of the demand for pest control is somewhat misleading because gross poundage figures are summations of pounds of many different kinds of pesticide materials whose chemical, physical, biological and environmental properties are radically different. For instance, the shift in the mid-1960s from relatively persistent chlorinated hydrocarbon insecticides to relatively non-persistent organo-phosphorous insecticides inherently increased pounds of material applied. Although historical time-series of pounds of pesticides applied can give us a gross estimate of the trends in pesticide consumption, the future demand for pest control must also be projected as a function of the expected pest infestation levels--including insects, weeds, fungi, and so forth. Unfortunately, the farmer cannot precisely determine the marginal productivity of incremental doses of pesticides. Furthermore, pest infestation levels can fluctuate widely from year to year depending on the weather, cultural practices, and so forth.

There are several important considerations to bear in mind when looking at pesticide poundage figures:

- In comparative analyses, pounds of different materials are seldom interchangeable on a 1:1 basis.
- Comparative and trend analyses must keep in mind dosage rates, number of applications required for control, and relative performance characteristics of the various pesticides.
- New methods of control may have considerably different measures for usage due to considerably reduced dosage rates (ounces vs. pounds) and/or other techniques which are not quantifiable in terms of units of weight.

Although continuous time-series data on pesticide use is relatively limited, we will utilize what data are available and relate them to the target crops in several different ways in order to ascertain if there are any discernible trends. Before we examine these relationships, we shall look at some of the pertinent characteristics of the pest-crop-pesticide interactions which bear significantly on the quantities of pesticides used.

Insecticides

Each crop has a unique set of insects which requires control. Not all acres of the crop require control nor are the same species of insects common to all crops or even to the acres requiring control within a particular class of crop. Therefore, we must define pest control in terms of a specific target pest (there may be primary and secondary targets in a given crop at the same time which can be controlled simultaneously) in a specific crop. Then, for each primary target pest, there is a level of infestation (economic threshold) which requires control measures. Economic thresholds are not only difficult to define in absolute terms, but they can vary from area to area and with the stage of development of the crop.

An important point to emphasize here is that we must view the crop in its time sequence over the growing season in terms of the functional work performed as outlined below:

- Land preparation
- Planting
- Care of the crop
- Harvest and handling
- Storage and sale

The above activities are carried out in sequential order through the growing season with an ever-increasing accumulation of dollars of input. Remember that no dollar return is received (except for occasional advances on expected crops) until the crop is made and sold at the end of the growing season. On top of the increasing doses of variable costs incurred throughout the season, the farmer has his fixed costs which he must live with all year.

Insect losses can occur anytime after planting the seed, but generally result from attacks on the foilage or reproductive parts of crops relatively far along in the growing season when already sizable amounts of capital have been expended in getting the crop to the stage where it is attacked by insects. Whether or not the actual damage inflicted on the crop by the insect economically justifies the control measures applied is difficult to assess. Certainly in many instances potential crop losses can and do exceed the costs for control without the treatment. However, farmers unquestionably do use a significant degree of pest control as insurance in the light of uncertainty and the relatively cheap cost (in dollar terms) for control.

In some crops, there may be several economic insects (including secondary infestations) or even a single insect which may require multiple applications throughout the season. There are a number of factors which have given impetus to a sub-optional use of insecticides. These factors include:

- Lack of adequate definition of pest specific economic thresholds
- Increasing pest resistance
- Lack of good estimate of potential crop losses
- Lack of clear understanding of the insect ecosystem and population dynamics
- Relatively inexpensive insect control measures

In light of the uncertainty resulting from the above factors, it is understandable both from the growers' standpoint and for practical reasons that insecticides have been used in the past and demand for their rise is likely to continue to be an integral part of modern, progressive farming in the future.

Table 6A shows some important trends for insecticide usage on the major insecticide using crops. The table lists the crops in descending order of pounds of insecticide applied in 1971, and gives related data for 1964 and 1966. Cotton, apples, and tobacco are the crops with the highest applied insecticide load per unit area as defined by the ratio of pounds applied to harvested acres. Note also that apples, tobacco, citrus, and potatoes constitute a very high percentage (81% to 97%) of the planted acres receiving at least one application of insecticides, while alfalfa and soybeans have a very low percentage of acreage being treated (7% and 4% respectively). Nevertheless, alfalfa and soybeans as a crop class are important users of insecticides because of the large number of harvested acres.

Although three data points for each of the crops and parameters shown in Table 6A are hardly adequate to define a trend, the table does develop a framework and bench marks for measuring and monitoring future changes. Cotton and corn should continue to dominate the picture as the major crop users of insecticides. There has been marked improvement in the efficiency in the use of apple insecticides as can be seen in the reduction in pounds applied without significant changes in acreage. Otherwise, Table 6A shows no other significant changes in usage patterns over the eight years covered, and implies that usage patterns will remain basically the same over the next several years. Longer term projections of insecticide usage would require in-depth analyses of the so-called "new generation" of pest control methods which are being studied under separate contract with the EPA.

Herbicides

Monoculture, or single crop agriculture, is an unnatural ecosystem subject to continual invasion of external weeds and germination of resident weed seeds. Weeds compete directly with the crop for space, nutrients, water, sunlight; interfere with harvesting and other cultural operations; and can reduce the quality of the harvested crop. Weed

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Table 6A

INSECTICIDES

Crop	Year	Treatment Acres (TA) (1000 A)	Acres Harvested (1000 A)	Ratio: (TA) to Harvested Acres	Pounds Applied (1000#)	% of Total Pounds Applied (%)	Ratio: Pounds to Harvested Acres	Harvested Acres as % of Harvested Cropland (%)	% of Harvested Acres Receiving at Least One Treatment (USDA-1966 Survey)
Cotton	1971	17,980	11,470	1.57	73,357	47.6	6.40	3.80	39
	1966	18,445	9,550	1.93	64,900	47.2	6.80	3.32	
	1964	25,650	14,060	1.82	78,022	54.5	5.55	4.79	
Corn	1971	28,486	64,050	0.44	25,531	16.6	0.40	21.21	38
	1966	24,285	56,930	0.43	23,629	19.2	0.42	19.77	
	1964	18,156	55,370	0.33	15,668	10.9	0.28	18.85	
Peanuts	1971	2,043	1,450	1.41	5,993	3.9	4.13	0.48	74
	1966	1,412	1,420	0.99	5,529	4.0	3.89	0.49	
	1964	n.a.	1,400	n.a.	n.a.	n.a.	n.a.	0.48	
Soybeans	1971	4,883	42,700	0.11	5,621	3.6	0.13	14.14	4
	1966	2,618	36,550	0.07	3,217	2.3	0.09	12.69	
	1964	4,109	30,790	0.13	4,997	3.5	0.16	10.48	
Apples	1971	1,454	464	3.13	4,831	3.1	10.41	0.15	92
	1966	2,100	411	5.11	8,494	6.2	20.67	0.14	
	1964	2,545	454	5.61	10,828	7.6	23.85	0.15	
Tobacco	1971	1,352	840	1.61	3,999	2.6	4.76	0.28	81
	1966	1,911	970	1.97	3,791	2.8	3.91	0.34	
	1964	2,566	1,080	2.38	5,471	3.8	5.06	0.37	
Citrus	1971	1,299	1,180	1.10	3,049	2.0	2.58	0.39	97
	1966	1,232	880	1.40	2,858	2.1	3.25	0.31	
	1964	853	780	1.09	1,425	1.0	1.83	0.27	
Potatoes (Irish)	1971	1,702	1,390	1.22	2,770	1.8	1.99	0.46	91
	1966	1,610	1,460	1.10	2,972	2.2	2.04	0.51	
	1964	1,210	1,270	0.95	1,456	1.0	1.15	0.43	
Alfalfa	1971	2,698	27,540	0.10	2,276	1.5	0.08	9.12	7
	1966	3,132	28,950	0.11	3,607	2.6	0.12	10.05	
	1964	n.a.	29,390	n.a.	n.a.	n.a.	n.a.	10.01	

Ratio of treated to harvested acres infers multiple applications to some of the acreage.
Cropland = cropland used for crops.

Source: USDA; SRI

species composition varies from field to field and from year to year. Few, if any, herbicides are broad spectrum enough to kill all the possible weeds that might invade a field, so combinations of herbicides and/or cultural practices are required to reduce the competition of weeds with the particular crop. In all cases, weeds are universally present even under the strictest field sanitary conditions.

Sales of herbicides is the fastest growing and dominant class of pesticides today. This reflects the substitution of herbicides for both labor (hand hoeing) and mechanical cultivation. The latter has disadvantages of high capital cost, use of heavy equipment which compacts soils, possible plant damage, and lack of skillful operators, in addition to the high cost of labor to run the machinery in multiple operations.

Unquestionably, weeds will continue to be a problem in the future and probably an increasing problem because of the relatively unnatural and disequilibrium environmental conditions created by monoculture. In addition, continual pressure on weed species composition creates a new species composition oftentimes resistant to presently used herbicides or at least requiring the application of a combination of herbicides.

Table 6B lists crops in order of importance as users of herbicides --measured in pounds of herbicide material applied. Usage of herbicides for each crop is increasing either as a function of increasing percent of acreage treated or increasing number of applications. Rice is the only crop near the saturation level of percent of acres treated. One particular crop class which should be monitored closely for changes in herbicide usage is pasture and range. We expect a significant increase in usage if steer-grain ratios continue at the recent low levels. With high cost grain, more cattle are expected to be pasture and range fattened which will induce farmers to make their forage lands as productive as possible; one means for this is the use of herbicides to eliminate undesirable plant species.

Table 6B

HERBICIDES

Crop	Year	Treatment Acres (TA) (1000 A)	Acres Harvested (1000 A)	Ratio: (TA) to Harvested Acres	Pounds Applied (Lbs.)	% of Total Pounds Applied	Ratio: Pounds to Harvested Acres	Harvested Acres as % of Harvested Cropland	% of Harvested Acres Receiving at Least One Treatment (USDA-1966 Survey)
Corn	1971	80,408	64,050	1.26	101,060	44.8	1.58	21.21	66
	1966	44,175	56,930	0.78	45,970	40.9	0.81	19.77	
	1964	33,430	55,370	0.60	25,476	33.4	0.46	18.85	
Soybeans	1971	37,684	42,700	0.88	36,519	16.2	0.86	14.14	28
	1966	10,997	36,550	0.30	10,409	9.3	0.28	12.69	
	1964	4,561	30,790	0.15	4,208	5.5	0.14	10.48	
Cotton	1971	19,673	11,470	1.72	19,610	8.7	1.71	3.80	56
	1966	7,166	9,550	0.75	6,526	5.8	0.68	3.32	
	1964	5,207	14,060	0.37	4,628	6.1	0.33	4.79	
Wheat	1971	25,505	47,670	0.54	11,622	5.2	0.24	15.78	31
	1966	16,657	49,870	0.33	8,247	7.3	0.17	17.32	
	1964	17,342	49,760	0.35	9,178	12.0	0.18	16.94	
Sorghum	1971	11,371	16,300	0.70	11,538	5.1	0.71	5.40	38
	1966	4,992	12,810	0.39	4,031	3.6	0.31	4.45	
	1964	3,385	11,740	0.29	1,966	2.6	0.17	4.00	
Pasture and Range	1971	7,532	n.a.	n.a.	8,336	3.7	n.a.	n.a.	1
	1966	8,055	544,510	0.01	10,506	9.3	0.02	n.a.	
	1964	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Rice	1971	2,653	1,820	1.46	7,985	3.5	4.39	0.60	95
	1966	1,080	1,970	0.55	2,819	2.5	1.43	0.68	
	1964	n.a.	1,790	n.a.	n.a.	n.a.	n.a.	0.61	
Peanuts	1971	2,698	1,450	1.86	4,374	1.9	3.02	0.48	66
	1966	1,086	1,420	0.76	2,899	2.6	2.04	0.49	
	1964	n.a.	1,400	n.a.	n.a.	n.a.	n.a.	0.48	

Ratio of treated to harvested acres infers multiple applications to some of the acreage.
Cropland = cropland used for crops.

Source USDA; SRI

In general, trends in the use of herbicides on all crops point toward continued increases in use as the percentage of acreage treated increases and the number of applications also increases--replacing hand labor and mechanical cultivation. At this time, new generation pest control methods for weeds do not appear to offer any significant alternatives to the broad spectrum and increasing array of organic herbicides.

Fungicides

A third important sector of plant pest control involves diseases which may be caused by fungi, bacteria, viruses, and physiological disorders (aberration of cells). Only diseases caused by fungi and bacteria can be controlled to any degree by a group of chemicals referred to as fungicides (regardless of the pathogen involved).

Fungicides differ from other classes of pesticides in that they have been used predominately for disease prevention rather than eradication of an existing disease. Seed treatments for soil and seed borne diseases and disease prevention in the high value crops are the dominant uses of fungicides.

Since fungicides are used in preventive programs, it is not anticipated that total demand for fungicides will increase significantly in the next decade. Certainly the historical growth rate in pounds--less than 0.5 percent per year--is expected to continue unless actions by EPA significantly change the availability of fungicides, particularly the EBDC (ethylenebisdithio-carbonates) group. Although saturation levels (Table 4) from the standpoint of proportion of farmers using fungicides and percentage of acres treated leave considerable room for expanding fungicide usage, it is felt that those farmers now utilizing disease prevention programs will continue to do so without significant increases in the proportion of farmers using the fungicides. Table 6C shows the important crops using fungicides and selected parameters. The

Table 6C

FUNGICIDES

Crop	Year	Treatment Acres (TA) (1000 A)	Acres Harvested (1000 A)	Ratio: (TA) to Harvested Acres	Pounds Applied (Lbs.)	% of Total Pounds Applied	Ratio: Pounds to Harvested Acres	Harvested Acres as % of Harvested Cropland	% of Harvested Acres Receiving at Least One Treatment (USDA-1966 Survey)
	1971	1,323	1,180	1.12	9,257	23.4	7.84	0.39	
Citrus	1966	1,005	880	1.14	4,056	13.3	4.61	0.31	73
	1964	844	780	1.08	4,929	7.8	6.32	0.27	
	1971	1,088	464	2.34	7,207	18.2	15.53	0.15	
Apples	1966	1,217	411	2.96	8,496	27.9	20.67	0.14	72
	1964	1,804	454	3.97	17,357	56.5	38.23	0.15	
	1971	1,698	1,450	1.17	4,431	11.2	3.06	0.48	
Peanuts	1966	582	1,420	0.41	1,108	3.6	0.78	0.49	37
	1964	n.a.	1,400	n.a.	n.a.	n.a.	n.a.	0.48	
	1971	852	1,390	0.61	4,124	10.4	2.97	0.46	
Potatoes (Irish)	1966	721	1,460	0.49	3,531	11.6	2.42	0.51	28
	1964	763	1,270	0.60	3,719	12.1	2.93	0.43	
Commercial Vegetables	1971	825	3,260	0.25	5,666	14.3	1.74	1.08	
	1966	594	3,420	0.17	4,093	13.4	1.20	1.19	22
	1964	801	3,270	0.24	4,530	14.7	1.39	1.11	
Major Desiduous Fruits and Nuts (excluding apples)	1971	1,604	1,430	1.12	6,981	17.6	4.88	0.47	
	1966	1,132	1,520	0.74	4,302	14.1	2.83	0.53	45
	1964	1,332	1,480	0.90	4,038	13.1	2.73	0.50	

Ratio of treated to harvested acres infers multiple applications to some of the acreage.
Cropland = cropland used for crops.

Source: USDA; SRI

only significant trends are the decreasing usage in apples and the increasing usage in citrus and peanuts. As with Tables 6A and 6B, trend interpretation is risky when the only available data are for three years; this is because pest, weed and disease problems can fluctuate markedly from one cropping year to another as a function of climate, cropping patterns, cultural practices, and so forth. Total fungicide use should remain relatively constant over the next several years with shifts in the proportionate share used by different crops as shown in Table 6C.

The relationship of the three classes of pesticides and their historical usage patterns are shown in Table 7 which also indicates the relative importance of the various classes of pesticides in terms of pounds of material released into the environment.

Table 7

PESTICIDE USAGE BY CLASS OF PESTICIDE

	Year					
	1964		1965		1971	
Class	MM Lbs.	%	MM Lbs.	%	MM Lbs.	%
Insecticides	156	57	149	50	170	39
Herbicides	84	31	115	39	228	52
Fungicides	33	12	33	11	42	9
TOTAL	273	100	297	100	440	100
Total farm use*	321	85†	353	84	494	89

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*All pesticides, exclusive of sulfur and petroleum.

†Total (MM lbs.) ÷ total farm use (MM lbs.).

Source: USDA; ERS; SRI.

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Projections

Because of the inherent difficulties in projecting the demand for pest control mechanisms as a function of the overall demand for pest control, the following table (Table 8) presents in a T-account form factors which we see as influencing an increase or decrease in the demand for pest control. On balance, it would appear that the pressures, particularly economic, for increasing demand for pest control outweigh the counterveiling pressures for a decreasing demand for pest control.

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Table 8

FACTORS INFLUENCING THE DEMAND FOR PEST CONTROL AND/OR PEST CONTROL MECHANISMS

Decreasing Demand	Increasing Demand
. Ecological consciousness.	. Pest resistance.
. Increased sophistication and technical competence in pest management.	. Increasing crop value (yield and dollars).
. Government programs.	. Increasing fixed costs.
. Species eradication.	. Substitution of capital for labor.
. Integrated pest control.	. Repetitive single crop monoculture.
. Area-wide management.	. Increasing costs: land, labor, interest rates, energy (fertilizer, fuel, equipment).
. Cost-price squeeze: input optimization.	. New solutions (chemical or other) to unsolved pest problems (e.g., poultry and livestock feed-through, nematodes, fungus gnat in greenhouses).
. Plant breeding: resistant varieties.	. Increasing size of farms.
. Certain cultural practices.	. Decreasing labor availability.
	. Expanded acreage.
	. Increasing demand for food: absolute and per capita.
	. Area-wide management.
	. Lack of persistence of organophosporous insecticides.
	. Lack of viable alternatives to presently used pesticides.

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Source: SRI

ENERGY*

Energy is and will continue to be for a decade or more a serious problem for the U.S. and much of the rest of the world. The ways in which this problem is resolved will be one of the key factors in determining the shape of the future through the remainder of this century. The developed nations of the world are dependent on low-cost energy for their industrial civilization. The lesser developed nations (the fourth world) have come to depend on low cost energy to feed their hungry peoples and to fuel industrial development. In the absence of a major technological breakthrough (e.g., fusion power) the future availability of low-cost energy to all nations seems unlikely. We have only recently come to realize how rapidly the demand for energy is increasing, how rapidly the supply of fossil fuels is diminishing, and how slowly alternatives are developing.

Consumption Trends

Since the mid-1920s U.S. energy consumption (fossil, hydro, and nuclear) has nearly quadrupled, rising from 20 quadrillion (20,000,000,000,000,000) Btus annually to over 80 quadrillion Btus projected for 1975. In the rest of the world the situation is similar, with a rise in energy consumption from 44 quadrillion Btus in 1925 to nearly 190 quadrillion Btus in 1968. It is worth noting that in the early part of this century nearly half the world's energy production was consumed by the U.S. More recently that ratio has fallen to less than a third. Clearly, this change in proportion is not due to any absolute decrease of U.S. consumption; rather, it is due to the more rapid increase in energy consumption of the other nations, particularly Europe, the U.S.S.R., and Japan.

The growth of energy consumption and the disparity between the U.S. and the rest of the world is demonstrated by the per capita consumption

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* Prepared by Peter Schwartz.

figures. In 1925 the per capita U.S. consumption was 180 million Btus, while globally the comparable figure was 23 million Btus. Since the world figure includes the U.S., the average American consumed nearly thirteen times as much energy as the other inhabitants of the earth. In 1968 the per capita U.S. consumption was 308 million Btus, while the whole world consumed only 55 million Btus per capita, a ratio of 8 to 1. The consumption of electricity, the life-blood of modern technology, exhibits an even greater gap. In 1964 the developed nations consumed 2800 kilowatt hours per capita, while the underdeveloped countries consumed only 82 kilowatt hours per capita of electricity--a ratio of 34 to 1.

Since 1965, energy consumption in the U.S. has been growing at the rate of 4.5% annually. If that trend persists, the level in 1990 will be double that of 1975. Even assuming some slowing to the rate of 3.1% annually, energy consumption would double by the turn of the century. There is significant uncertainty in the forecasts of energy demand. Some are as low as 180 quadrillion Btus annually by the year 2000, while others go as high as 250 quadrillion Btus/year.[1] World energy consumption may even rise to over 500 quadrillion Btus annually. At both the domestic and global level this represents a tenfold increase in less than a century, illustrating the awesome implications of exponential growth.

In relation to food supply, the production, processing, and distributing of food have become more and more reliant on cheap energy. In California the agricultural industry uses 5.07% of all energy consumed in the state. Nationwide, the production of raw food alone consumes 3.5%.[2] Less energy intensive methods of cropping (e.g., rice paddy) are more energy efficient, but have lower yields than modern methods. Thus the dramatic rise in yields has been bought in part by abundant, inexpensive energy. However, there is also a point of diminishing returns where, for example, a ten or even fiftyfold increase in the use of energy yields only a doubling or tripling of food output.[3] "We estimate that the 40 percent of the food energy that comes from meat and other animal products like butter, eggs, and oils, requires over 80 percent of the feed energy harvested annually from crops."[4] Of course, many fertilizers are also dependent on fossil fuels for feedstock and thus are sensitive to rises in oil prices.

The situation with most modern pesticides is different. While the complex synthetic organics like carbofuran do indeed use petroleum as a base, it is the extremely complex processing which is the significant cost factor. The recent experience of rising pesticides cost is due more to increased demand than to rising oil costs.

In general, however, the enormous output of modern agriculture is threatened by rising energy costs. This, considered against the background of the global food problem, suggests a significant potential for global conflict.

Sources of Supply

Petroleum and natural gas have been principal energy sources for fueling the recent rapid rise in worldwide energy consumption. Earlier, roughly in the mid-1800s, almost all the energy consumed in the U.S. came from renewable sources such as wood, animal feed, wind, and water. Only 7% was supplied by the fossil fuel coal.[5] The production of coal grew very rapidly until the turn of the century, and then remained level until the present. In 1910 coal produced 12.7 quadrillion Btus and in 1970, 12.9 quadrillion Btus.[6] In contrast, production of petroleum and natural gas, which were unimportant before 1900, has grown at a phenomenal rate. Petroleum supplied only .23 quadrillion Btus in 1900, while in 1970 it supplied 29.6 quadrillion Btus, a 129-fold increase. Natural gas as an energy source has grown from .25 quadrillion Btus in 1900 to 22 quadrillion Btus in 1970, an 88-fold increase. While the actual quantity of coal consumed has not declined, the percentage of energy supplied by coal has diminished rapidly. Almost all growth in energy consumption was fueld by petroleum and natural gas, as the figures in Table 1 show.

Table 1

Sources of U.S. Energy Supply

	1920	1950	1973
Coal	78%	38%	18%
Petroleum	14	39	46
Natural Gas	4	18	31
Hydropower	4	5	4
Nuclear	-	-	1

Two aspects of the energy supply situation are particularly worth noting. First, we have become increasingly dependent on foreign oil. In 1960 we imported 18% of our oil; by 1973 that figure nearly doubled to 35%. Almost 15% of the U.S. energy is supplied from other countries' oil stock,[7] and over a third of that comes from the Arab nations of the Persian Gulf. In addition we have also begun to import a small but increasing fraction of our natural gas.

Second, the time to depletion of the known domestic reserves of petroleum and natural gas is only decades away. While there are varying calculations of the size of domestic reserves, most agree that if no new major deposits are located and current rates of consumption persist, the natural gas will be gone before the end of the century and the petroleum shortly thereafter. However, if new deposits are located or incentives (e.g., rise in price) are provided to make exploitation of currently known--but uneconomical--reserves worthwhile, then the life span of oil and gas could be extended significantly.

Coal, on the other hand, exists in great quantities in the U.S. and could and most likely will supply a much greater share of U.S. energy in the future. Two major problems, however, inhibit the further development of coal resources: how to get it out of the ground without ravaging the surface environment or killing and maiming miners, and how to burn it without making the air unbreathable. Two other short-term problems will inhibit immediate expansion of coal production. First, many boilers are not equipped to handle coal and must be converted; and second, there is a shortage of equipment to operate both surface and underground mines.

With respect to the safety problems of underground mining, new technology going into place now will gradually improve conditions, however, real increases in production will take time. The environmental problems of surface mining are much more difficult. In the Appalachians the hills are often too steep for reclamation. In the Midwest the coal has a high sulphur content which is expensive to clean out from stack exhausts. In the West there is insufficient water for reclamation and processing. All of these are potentially soluble problems, but this will take time.

Thus imported oil, particularly Middle Eastern oil, will continue to be a major source of U.S. energy for at least a decade to come. However, continued reliance on this source presents several major problems. Political issues can result in a stoppage of oil importation from the Middle East. Unfortunately, there is no reason to believe that the grave political problems of that region will ease soon or that U.S. attitudes toward support of Israel will shift dramatically in the short run. Also, we will have to compete for that supply with other industrialized nations of the world, which are even more dependent on Arab oil. This increases friction among the nations who depend on each other for trade and political alliances. Finally, serious economic problems--such as the U.S. balance of payments, disruption of the world monetary system, and global and domestic inflation caused by high oil prices--are involved.

Nuclear power in fission reactors supplies only a small fraction (less than 1%) of current U.S. consumption. Advocates of nuclear power feel that if developed rapidly it could make a major contribution fairly soon (before 1990). However, it hardly needs be said that there still remain a number of very controversial issues surrounding nuclear power. Are nuclear reactors, themselves, safe? Can thermal wastes from nuclear reactors be handled without severe problems? Can radioactive wastes be disposed of safely? Can potential threats from terrorist activity be adequately safeguarded against? Until such problems are resolved the development of fission power will proceed, but more slowly than its advocates would wish.

Other potential energy sources such as fusion power, shale oil, synthetic fuels from coal, solar, geothermal, and wind power are not likely to make any significant contributions soon, if ever. Major technological, economic, or environmental problems associated with these alternative energy sources have yet to be resolved. Power from hydrogen fusion, for example, is at least decades away from practical development. The technology is in its infancy and no one is really sure if it can be made to work anytime in the foreseeable future.

Conservation efforts are now viewed as making a significant contribution toward reducing demand and thus easing the energy problem. Major savings can be achieved in transportation (e.g., improving auto mileage), housing (e.g., better insulation to save on heating), and industrial processes. However, even if such savings can be achieved they are of a largely one-time nature. That is, they postpone the doubling of demand, so that demand would double by 2000 instead of 1990. But demand would continue to rise inexorably.

At this point it is worth taking a brief look at why demand has risen so rapidly. These explanations include population growth: more people use more energy; rising GNP: more production demands more energy; rising affluence: more people living at a higher level of material consumption need more energy (for air conditioners, appliances, cars, etc.). Also, low cost energy made it economical to replace increasingly expensive

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labor with machines. Perhaps even more fundamental than these reasons is a basic principle of a capitalist economy; issues surrounding the distribution of wealth are avoided by allowing everyone's absolute share to grow while relative shares remain roughly constant. Thus growth is essential if the absolute shares of wealth are to continue to grow. Cheap energy has made it possible for a greater proportion of Americans to enjoy a high material standard of living, reflected in a moderate leveling up in the distribution of wealth. Any halt in growth, without major changes in the system, would freeze the absolute and relative shares of wealth. While this might be less traumatic for those already enjoying affluence, it would certainly lock those living in poverty into their sad state.

Options for the Future

Three major kinds of alternatives are now being debated, each of which has significantly different consequences in both the short and long term. The first is the continued rapid growth alternative. We should develop supplies as rapidly as possible--dig the coal, drill for oil and gas, and build the nuclear reactors. New technology, particularly fusion, will come along soon enough to save the day when supplies run out. Technology will also be able to cope with the environmental problems. This alternative is clearly a high risk one. If the technology fails to cope with either supply or the environment, or both, then our economy may eventually collapse for lack of energy and/or our environment may become uninhabitable. If technology succeeds, of course, more people will live more affluently. Because of the tremendous risks involved, few leaders are seriously advocating this course.

The second alternative is moderated growth through conservation. By applying technological means conservation can slow the growth rate of energy use, thus extending the life span of current supplies and perhaps reducing dependence on foreign oil. This would allow more time for new technology to be developed and for readjustments in consumption patterns. The change in the way in which people live would be moderate (e.g., smaller cars, somewhat higher energy costs). In the long term the dependence on new technology leads to similar risks as in the first alternative. Because of our basic faith in our inventive capacity and in our apparent ability to retain the existing system without basic changes, this is the most widely advocated alternative.

The third alternative is the low or zero energy growth option. In the next decade or so we would level out our energy demand to some optimum level by means of major reorganizations of economic activity and very significant changes in consumption behavior. This involves such things as reorganization of agricultural practices (perhaps replacing machines with human labor), reduced dependence on automation, more durable goods, more mass transit and fewer autos, elimination of "frills" (e.g., widespread air conditioning), creation of new jobs through some form of transfer payments. Such dramatic changes toward a more frugal way of life involves a major shift in American values. The results of this option might be less pollution, lower material standard of living, but perhaps a higher quality of life, and easing of the gap between the U.S. and the poorer nations. A small but increasing minority of people are advocating this alternative.

In conclusion, we simultaneously face two kinds of problems: those related to energy, resources, and environment and those related to poverty, employment and social welfare. The solutions to one set seem to exacerbate the problems of the other. Whatever policy approach is ultimately adopted must somehow deal with this dilemma.

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ECOLOGICAL IMPLICATIONS OF PESTICIDES[*]

Introduction

Brubaker (1972) defines "pesticides" as a generic term referring to "all kinds of chemicals used to kill organisms inimical to human purposes" (p. 78). These chemicals (which include herbicides, rodenticides, insecticides) are, along with fertilizers, among the most critical man-made inputs necessary to insure maximum yield, quality, and certainty of crop output. Thus, in a world required to produce escalating quantities of food in order to avert the human misery and social disruption engendered by massive famine, it seems only plausible to anticipate the use of increasing increments of pesticides. Yet, there is also the disturbing feeling that in killing organisms inimical to human purposes, we may eventually impinge too closely upon man himself.

We presently introduce over 1 billion pounds of pesticides annually into the domestic environment. Common sense dictates that one consider whether we may be fostering an "irresolvable" but nonetheless plausible dilemma--that of choosing between (a) restricted pesticide use domestically, resulting in starvation/chronic malnutrition abroad; or (b) the gradual poisoning of large populations as domestic and international food demands are met. However, at present, there is virtually no empirical evidence to support the probable emergence of such a dilemma. Nonetheless, since the publication of Rachel Carlson's book, Silent Spring, there has emerged a new level of public uncertainty and anxiety regarding the wisdom of very high and sustained levels of pesticide use. Thus, for both psychological as well as potential, but largely unknown, biological reasons there is cause for concern. More specific dimensions of such concern are considered below.

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[*] Prepared by Duane Elgin

Impact on Humans

Pesticides are explicitly designed to kill living organisms, and, as such, they are oftentimes indiscriminate in their rendering of damage and may kill more life than intended. The indiscriminate character of pesticide impact and the fact that it may have unexpected and unintended consequences as it travels through and concentrates in remote parts of complex food chains, suggests that humans should be wary of the poisons they introduce into the environment. Nonetheless, it is quite difficult to show the demonstrable dangers of pesticide use. Brubaker (1974) states:

> Apart from the acute toxicity of [direct] exposure to spray or liquid chemicals, the [indirect] effects of pesticides on human beings are largely speculative . . . we must return to the fact that, while deaths can be attributed to improper handling of pesticides, none have been known to result from their residuals in the environment. (p. 82.)

Thus, with respect to the indirect impact of pesticides upon human populations--given that pesticides are seldom specific as to the time, place, or target of their chemical activity--it would seem only plausible that their increased use may cause some degree of health and environmental problems. Yet, the lack of rigorous data make even rough estimates of present and anticipated impacts of pesticides upon human populations difficult.

Since pesticides are intentional biological poisons, we naturally assume that they may represent a first-order environmental hazard. Yet, man introduces many contaminants into the environment and it is by no means clear that these "unintended poisons" do not represent a greater health and environmental hazard than do the pesticides. We may be disproportionately concentrating our attention on contaminants which are relatively innocuous when seen from a larger perspective of both intended and unintended poisons. Clearly, much more research is needed.

Impact on Non-Target Populations

While the indirect impact of pesticides upon human populations is quite ambiguous, there are more discernable impacts upon non-target pest and plant populations. Pimentel (1971) summarized the ecological effects of pesticides on non-target species:

> Pesticides tend to reduce significantly the numbers of individuals of some species in biotic communities . . . An important reduction in the number of species within a community may lead to instability within that community and subsequently to population outbreaks because of alteration in the normal check-balance structure of the community . . . After pesticide applications the species populations most likely to increase in numbers are those in the lower part of the food chain, that is, the plant feeders . . . In addition, any effective loss of species or intense fluctuations in numbers of species low in the food chain may adversely affect the dependent predator and parasitic species at the top of the food chain. This in turn further disrupts the structure and ultimately the stability of the natural community. (p. 182.)

More specifically, pesticides may reduce the biological diversity of the localized ecosystem. Brubaker (1972) describes how this can occur:

> Agriculture itself is the original simplification of the ecosystem in replacing many species with a single plant. Modern agriculture carries this to an extreme with entire regions often given over to a single crop . . . Overly simplified biotic communities are less stable and are subject to rapid changes when a species multiplies free of competitors or outruns food supply. The introduction of pesticides into this system simplifies it further by eliminating many competing species, often including those which prey on the pests. With the natural system of control of numbers so completely disturbed, pest control becomes dependent on the use of chemicals. We become addicted to them. (p. 80.)

Not only do we become addicted to the use of chemicals, but we must use increasing amounts to achieve the same effect. With continued application of pesticides, the most susceptible strains of pests die out while the hardier and/or mutant pests survive. This necessitates either the use of greater quantities of pesticides to yield the same degree of pest control or development of ever more powerful chemicals. Brubaker (ibid) cites an interesting case in point:

> The combination of resistance and the disappearance of natural enemies may compel spectacular increases in dosage. As an example, the resistance of the bollworm in the Texas Rio Grande Valley to insecticides used in its control increased 30,000 times between 1960 and 1965. (p. 80.)

Conclusion

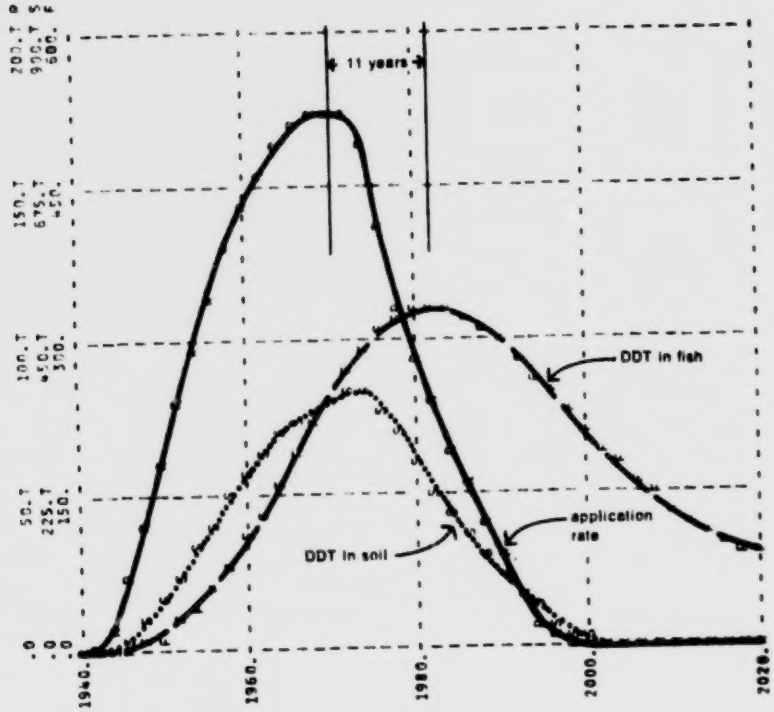
A "balance sheet" reflecting the major costs and benefits of pesticide use is presented below.

Benefits	Costs
• increase yields	• kill non-target species
• increase quality	• indirect human health effects (largely unknown)
• increase certainty	• direct poisoning of humans
• less need to diversify crops	• pest resistance increases
• enhance economies of scale	
• save on labor costs	
• public health benefits	

On balance, the case for increased pesticide use seems more compelling than the case for substantial restriction of pesticides. The benefits are relatively certain and near term whereas the costs are relatively uncertain and long term (and thereby subject to substantial social discounting).

Despite the "aggressive" pesticide policy implied by the foregoing balance sheet, there is additional reason for caution. There are oftentimes long delays between the release of a pollutant into the environment and the appearance of a negative effect within the ecosystem. An illustrative example of natural delays in ecological processes is shown in the following figure.

DDT FLOWS IN THE ENVIRONMENT*



Calculation of the path of DDT through the environment shows the probable result if the world DDT application rate began to decline in 1970. The application rate shown is historically correct to 1970. DDT in soil peaks shortly after the application rate begins to decline, but DDT in fish continues to rise for 11 years and does not fall back to its 1970 level until 1995. DDT in fish-eating animals, such as birds and man, would show an even longer delay in responding to the decrease in application rate.

SOURCE: Jørgen Randers and Dennis L. Meadows, "System Simulation to Test Environmental Policy I: A Sample Study of DDT Movement in the Environment" (Cambridge, Mass.: Massachusetts Institute of Technology, 1971).

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*Source: Meadows, D. et al., The Limits to Growth, New York: Universe Books, 1972, p. 83.

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Meadows *et al*. (1972) discuss the problem of control inherent in such ecological processes:

> Whenever there is a long delay from the time of release of a pollutant to the time of its appearance in a harmful form, we know there will be an equally long delay from the time of *control* of that pollutant to the time when its harmful effect finally decreases. In other words, any pollution control system based on instituting controls only when some harm is already detected will probably guarantee that the problem will get much worse before it gets better. Systems of this sort are exceedingly difficult to control, because they require that present actions be based on results expected far in the future. (pp. 83-84.)

Clearly, there is substantial danger in the formulation of pesticide control policies under conditions of uncertainty; i.e., premising policy upon the assumption that if there is no demonstrable damage that can presently be measured or reasonably anticipated, then there is no need for restrictive control. Such a policy premise may guarantee that by the time the danger is demonstrable, then it may be too late for other than ameliorative policy. Thus, a difficult policy trade-off emerges between uncertain costs (e.g., introduction of carcinogenic compounds) and certain benefits (e.g., increased food production when many are starving). The certain benefits create substantial pressures for increasing pesticide application while uncertain costs create, politically, a tenuous base from which to argue for limitation of use. Nonetheless, to wait for obvious, detrimental manifestations to appear could be to defer too long. As Nisbet (1974) concludes: "Until we are able to make sounder predictions, simple prudence requires that we should be over conservative in regulating the use of these uncontrollable chemicals." (p. 11.)

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WORLD SOCIETAL TRENDS--1975-2000*

Introduction

During the 25 years under discussion world societal trends will be inevitably influenced by the immutable absolute growth of world population on the one hand and the corollary to that growth, the equally immutable decline, both absolute and relative, in per capita shares of nonrenewable raw materials, including arable land and fresh water. The only room for debate on these two trends is in the determination of how great will be the growth of the former and the decline of the latter. For the purposes of this trend analysis it is necessary to consider only the way in which population growth and declining per capita shares affect or produce other possible societal trends.

The analysis of world political trends done for this study argued against the probability of any nuclear or other large scale conflict (international or civil) involving the major powers or industrially developed nations during the remainder of the twentieth century. If true, this indicates that the major societal trends in these countries will be evolutionary rather than discontinuous. The same analysis foresaw the division of the underdeveloped world into two groups of nations or associations of nations.

The first of these groups, of which the oil producing states, especially the Arab states, provide the most obvious example, possess significant amounts of raw materials necessary to the functioning of the industrial nations. They will provide these materials only under terms most favorable to themselves, meaning, more specifically, the controlling groups in their states. In some, probably most, cases the wealth thus obtained will be used as a means of entering into a fuller partnership with the controllers of the means of production within the industrial nations. The multinational corporation as it evolves will most probably be the means for this.

The societal result of this process for these developing nations will be in accord with the trend that can be seen historically in such countries

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*Prepared by David MacMichael

as Mexico. There will be an expansion of upper and middle class groups which will adopt the social forms of the middle classes in the developed countries. Modes of family organization and consumption will tend to be identical with or only slightly modified from prevailing patterns in the developed countries. However, these patterns will not spread beyond these classes. Most of the population will tend either to retain traditional societal forms or, where the traditional forms are unequal to distortions produced by economic change, to evolve new forms divorced from tradition but not resembling those of the middle class. The latter phenomenon, exacerbated in traditional agricultural societies by the two dominant trends--population growth and non-availability of land--is most visible in the growth of huge urban centers with their vast unemployed or underemployed refugees from the depressed rural areas increasingly typical of Latin America and non-Communist Asia and now beginning to appear in Africa.

This trend, with its obvious economic implications for the expansion of markets for industrial goods and the introduction into the advanced sectors of these nations, including the agricultural sector, of modern techniques, also implies that the controlling groups will tend to identify their interests with those of the industrial nations who are at once their customers and their suppliers of modern goods. This implies, politically, that such countries will tend, despite occasionally conflicting rhetoric, to align themselves with the advanced countries. Where, as is frequently the case in Latin America (traditionally an exemplar of this trend)* there exists an ethnic or cultural distinction between the controlling groups and the mass of the population the tendency will be magnified.

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*Although the sometimes strong antipathy that has existed between the Latin American countries and the United States may seem to contradict this thesis, it should be noted that the Latin American upper classes have rarely been nativist. Anti-*yanqui* Latin American aristocrats usually tended to identify with their European counterparts--French or English. (See the discussion in Herman Kahn and B. Bruce-Briggs, *Things to Come: Thinking About the 70s and 80s* (MacMillan, 1972), 74.)

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On the other hand, where, as in some of the Arab countries, ethnic and cultural bonds (Arab and Muslim) create other than class unity between the upper and lower classes, and the wealth created by possession of some natural resources (such as oil) is so large as to make a more general raising of consumption standards possible, and where the traditional culture is both very distinct from that of the developed countries and not considered inferior to it (e.g., Islamic culture with a history of periods of civil and military superiority to that of Europe) there is a possibility of a differing societal trend. In such a circumstance there may be a tendency to invest the returns from sale of natural resources in the development of a broad-based industry and agriculture that will be, at all levels of society, supportive of distinctive, tradition-related societal norms. Insofar as technology itself imposes societal form to a significant degree the result in many important aspects will necessarily be the adoption of the norms of the developed nations. However, contrary to the situation in the prior case, societal change would spread more or less uniformly (allowing for socio-economic class differentials) through all strata. Additionally, traditional forms that are compatible with technological development--as in dress, family organization, education, dietary habits, religious practice, and so forth--will have a tendency to be retained.

A variant of this situation will occur where the local culture is strong and where there is ethnocultural unity but where the wealth produced by the sale of natural resources is insufficient to support genuine, broad, national development on technoindustrial lines. In such a situation it is possible that the controlling groups will modify traditional societal patterns to accord with a developed nation consumption level which will not be widely shared. The rest of the nation will remain in an unmodified traditional state. Under these circumstances, the controlling groups will use their public and ceremonial adherence to traditional patterns as a device for pacifying the traditional population. Alternatively, where the discrepancy between the consumption levels of the controlling groups and the mass of the population produces significant political disaffection, the elites may abandon any attempt to retain traditional modes and unashamedly ape those of their developed country patrons in order to qualify for support and protection. An expression of this attitude in the past has been conversion to the religion of the advanced country: e.g., the Methodism of the Soong family in China and the Presbyterianism of Syngman Rhee in Korea were employed as means of gaining American support against non-Christian rivals.

In those unfortunate countries devoid of most resources save people--primarily sub-Saharan Africa and the Indian subcontinent--and enjoying few strong economic bonds with either the developed countries or favorably endowed developing ones, it seems very possible that the societal trend will be toward a debased traditionalism. Just as the defeated and demoralized Plains Indians of the American West turned to the Ghost Dance as a means of bringing back the buffalo, the leaders of Asian and African nations unable to stay in the development race will tend to turn backward and inward. Signs of this are increasing. In African countries such as Chad even the educated elite are required to adopt tribal names and submit to ancient initiation rites and ordeals. Missionaries are less and less welcome. In India foreign scholars are actively discouraged from observing traditional life and writing what are regarded as invidious accounts of it. Xenophobia is rampant in many African nations, _vide_ Uganda where the more modernized Asians have been expelled and Westernized locals terrorized and repressed.

To the extent that these have-not countries can succeed in restoring or creating more or less viable low technology societies along traditional lines this trend, representing a relaxation of the pressures caused by the revolution of rising expectations, is by no means to be considered totally a bad one.* The disruption of traditional social and agricultural patterns

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*See, e.g., Ernest F. Schumacher, "Intermediate Technology," _The Center Magazine_, January/February 1975, 43-44.

in the Sahel partly as a result of well-meant, foreign-directed, development programs can serve as evidence for such a view.

Where, however, traditional practices will not suffice for the existence of a viable society at some life and spirit sustaining level, and where the resources to establish a viable simulacrum of a technological society do not exist and cannot be supplied from without, the prognosis is for societal breakdown and human tragedies of great dimensions. Again looking at Africa, the recent collapse of the ancient Ethiopian monarchy as a result of its inability to cope with the stresses brought on by crop failures (exacerbated by the controlling factors of population growth and diminished per capita resource availability) is symptomatic of what might be expected.* As noted in the world political trend analysis, rival factions among the controlling elites in such countries may be expected to engage in civil and, occasionally, international wars for power over the limited resources which they possess. Where there is ethnic, tribal, or cultural division such struggles will be more likely to occur and will be of longer duration, involve more people, and intensify societal distinctions among them.

Any discussion of world societal trends in a framework such as is used here cannot ignore the existence of the great anomaly--China. In a situation embodying all the elements of the survival crisis facing the underdeveloped world today--unchecked population growth, depleted soils, mass illiteracy, an almost nonexistent transport and communications network, widespread disease, extreme maldistribution of wealth, a discredited and collapsing set of traditional governmental and social organizations, corruption, civil war, and general demoralization--China seemed fated to be a playground for the

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*An interesting contrast can be seen in Iran. There the existence of the natural resources (oil and some reserves of arable and potentially arable land) have supported the Shah in his at least symbolic restoration of the traditions of the Persian Empire.

Four Horsemen. The triumph of the Chinese Communists seemed, for most Western observers, at least, to set the seal upon interminable disaster. Even such astute commentators as William and Paul Paddock writing in the mid-1960s could state flatly:

> Now China is on the direct road to famine. The collision between population explosion and static agriculture seems truly inevitable. The only agency left to deal with this fated doom is the communist government in Peking. The resourceful farmers and the versatile entrepreneurs who might have found ways to lessen or perhaps deflect the catastrophe have long been removed from the national economy.*

The Paddocks, and numerous other commentators as well, were disadvantaged by having to observe China through not only ideological blinders but also through the curtain of ignorance which, as Felix Green pointed out, had been thrown up by the government of the United States. However, given the existence of the same obstacles that appeared to be defeating the rest of the underdeveloped world, there was really little reason to believe the Chinese would succeed where others were failing.

Surely, though, much can be explained by the existence of the positive societal factors of ethnic homogeneity and a strong and proud cultural identity which, though dormant, proved capable of being reawakened and adapted to new and effective forms of social organization. In addition, the existence of previously unsuspected supplies of natural resources necessary to support a massive, self-generated technological thrust forward has been critical to the Chinese success. And, of course, apart from the moral judgments one may apply, China's political leaders over the past 25 years have been men of abilities rarely, if ever, surpassed in human history.

It is, perhaps, something of a misstatement to refer to the Chinese experience as an anomaly. After all, China encompasses almost 20 percent

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*William and Paul Paddock, Famine--1975! (Little, Brown and Company, Boston, 1964, p. 160).

of the human race. However, except in certain contiguous areas such as Korea and, to a lesser degree, Vietnam which share an ethnic homogeneity and cultural identity comparable to that of the Chinese as well as having a similar economic base on which to build, it seems improbable that the Chinese experience will be duplicated.

Japan

If it can be assumed that China, barring the possible but improbable disaster of nuclear war with the Soviet Union, will continue pursuing its inscrutable, largely isolated course, creating a viable cooperative commonwealth, and surviving on its own resources and without famine, regardless of what occurs elsewhere in the world, then the focus of this analysis should be on the interrelated remainder of the planet. Using the framework developed in the first section--developed nations (free market and socialist), potential developed nations (full scale development and limited development), and potential disaster areas--specific societal trends, with their implications for pesticide policy will be discussed at greater length.

Since the model sketched in the first section assumes that--as in the last century--the developed nations will provide the societal forms toward which the developing will aspire, the trends in the former will be plotted, and then the manner, form, and timing of their adoption in the latter will be described.

With reference to the dominant societal factor of population growth rates the trend within the developed countries--both free market and socialist--has been toward population stability. Japan, the oriental representative in this group, blessed with an ethnically homogeneous and culturally united population and, over the past 25 years especially, a remarkably well-articulated and widely agreed upon set of national goals has, since the war, aimed at stabilizing its population. Since the early 1960s Japan's birthrate has been at or below replacement levels with population increases accounted for only by declining death rates. Within the next decade Japan should have achieved a stable population. (It should be noted that the

Japanese achieved a replacement birthrate prior to the widespread availability of contraceptive pills, intrauterine devices (IUD), or other of the more recent developments in birth control technology. Reliance until recent years was more on abortion than on either contraception or continence.)

Japan traditionally was and remains very much a child-oriented society. Before the Second World War it had a strong pronatalist policy and a very high birth rate. The consequent rate of population growth was used both to justify and support an aggressive, expansionist foreign policy. Obviously, the failure of this foreign policy in the crushing defeat in 1945 and the fact of confinement to the crowded home islands left Japan little choice but to reverse the natalist policy. (That other nations in comparable situations have been unable either to make the obvious choice or, their governments having done so, been unable to make it operative is a key societal fact of recent world history.)

Another factor in the Japanese success at achieving population stability that should not be overlooked was that Japan at war's end was already a largely urbanized and partially industrialized society.* Only about one third of the population lived on farms where the ability of the family to use children as unpaid labor, and, later, to provide social security for the parents builds a pronatal bias into family planning. The land reforms imposed by the American occupation authorities and the rapid growth of Japanese industry in response to the stimulus of the Korean War decreased the farm population very greatly. This, plus the export-oriented nature of Japanese industry which devalued the importance of increasing the domestic consumer base, made antinatalism a rational policy from the perspective of both national and individual planning. At the same time, the declining rural population was still numerous and youthful enough to supply recruits for the expanding industrial labor force.

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*The usually perceptive Daniel P. Moynihan overlooks this factor in his invidious valedictory address, made on leaving his post as Ambassador to India, which contrasted Japan's industrial rise with India's economic stagnation (over the past 25 years).

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Still another important factor in the societal evolution of Japan during the past quarter century was the existence of a strong, proud traditional culture. The social forms that developed during the period of rapid urbanization and industrialization were not mere imitations of Western modes but viable Japanese adaptations of them. The most significant manifestation of this was the manner in which Japan, while participating in the international economy of the Western industrialized nations as an increasingly formidable competitor, developed and clung to its own forms of corporate organization and procedure.[*] The Japanese business-government partnership that came to be known disparagingly but envyingly by Western businessmen as Japan, Inc., stood fast against Western, particularly American, efforts to buy into Japanese firms. When Japanese firms expanded overseas they did not, like most Western multinationals, attempt to integrate local managerial talent into their operations. They remained, oblivious to criticism, almost entirely Japanese.

From the social point of view the insistence on preserving the purely Japanese character of business firms allowed the maintenance and elaboration of traditional consensus decision-making processes and, perhaps more importantly, of the familial character of the major corporations. The most often commented on aspects of Japanese industrial society in this regard are: the engagement of worker loyalty and involvement through the guarantee of lifetime employment, and the refusal to consider labor as a commodity.

The concept of the members of the firm, from the lowest to the highest, as the members of a family all committed to the same ends--even when expressed in such activities as the mass singing of company songs at the

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[*] See Richard T. Johnson and William G. Ouchi, "Made in America (Under Japanese Management)," Harvard Business Review, September/October 1974, 61-69. Also, Frederick C. Thayer, An End to Hierarchy! An End to Competition: Organizing the Politics and Economics of Survival (New Viewpoints, 1973), 40-41.

beginning of the work shift which might appear absurd and even embarrassing to the outsider--is indicative of the strong ethnic and cultural homogeneity of the Japanese people. As indicated in the first portion of this discussion, such a sense of community within a developing nation is conducive to generalized and pervasive rather than partial development. Thus, despite the existence of obvious income differentials in Japan, there is not a sharp division between a modernized and nonmodernized sector. In greatly simplified terms, all Japanese contributed to the effort to build up the modern Japanese economy, and all Japanese share (even if not equally) in its results.

Further evidence of the manner in which ethnic and cultural homogeneity combined with the sense of possessing a superior cultural tradition allows for the continuance of distinctive aspects of older customs, during the period of industrial development, can be seen in the retention of traditional costume for use in nonwork situations; in stubborn adherence to traditional patterns of mate selection and marriage; and in the dominance of traditional art forms. On the other hand, there have been major changes, too. In addition to the change from the large family to the small family norm that accompanied the rural-urban transition, there has been an enormous shift in attitudes toward the elderly. The traditional extended family that embodied an extreme reverence for the senior members has not survived the move from the farmhouse to the two or three-room city apartment. Just as importantly, the declining death rate has given middle-aged Japanese an embarrassing surplus of surviving parents. Moreover, the lengthening lifespan has caught the official state institutions offguard, as well. The Japanese social security and retirement system is geared to an earlier time of lesser life expectancy. Retirement begins at 55. Recent Japanese films and novels reveal the personal and official difficulties being experienced through the inadequacies of societal mechanisms for dealing with the aged.

Japanese society has also adopted the trend of other advanced nations for lengthening the period of formal education. One result has been a decrease in the flow of fourteen-year-olds into the labor market with possible severe consequences for the system of labor relations described above. The eighteen-year-old secondary school graduate now being recruited by industry is proving, according to Japanese press accounts,[*] to be less manually adept and less suited to vocational training than the junior high school graduate of ten years ago. It may be presumed that the older and better educated entrants into the labor market will be, as their counterparts in Europe and the United States have been before them, more inclined to seek white collar and service jobs and to shun the less prestigious but more skill-demanding blue collar occupations.

Of even greater significance for this analysis, however, are the apparently more superficial changes in patterns and levels of consumption that accompanied Japanese post-war economic growth. Traditional Japan had been a frugal and abstemious nation. Diet was rice, fish, and pickled vegetables. Personal possessions were few and essential.

In recent years, even while retaining many traditional forms of societal organization and customs, the Japanese have increased markedly their levels and types of consumption. The traditional cuisine is still favored but people eat more of it and more of its luxury dishes. At the same time the old diet is supplemented and expanded by consumption of the foods associated with the Western industrial countries--wheat bread, meat (especially beef), milk and milk products, eggs, fruits and vegetables regardless of season, and so forth. One result has been the remarkable increase in the height and weight of younger Japanese; another has been increased reliance on food imports.[**]

Individual ownership of automobiles, television sets, refrigerators, washing machines, and electrical appliances of all sorts has become commonplace if not universal. Concurrently, individual consumption of fuels and

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[*] *Japan Times*, October 27, 1974, p. 10.

[**] See, Geoffrey Murray, "Making Ends Meet in Tokyo," *Atlas*, October 1974, pp. 46-47; "Japan's Problem: No Native Food," *Washington Post*, February 22, 1975, p. 3.

energy (although still very low by U.S. standards) has risen manyfold over prewar levels. It is important to note that Japan is almost totally reliant on foreign sources for most of the raw materials that go into the manufacture of these new goods which they both consume in ever greater amounts and on whose continued export they rely for national economic survival as an industrial state.

Thus, although many traditional societal forms can and do, as the Japanese experience demonstrates, survive the period of modernization and technological development where the appropriate ethnic and cultural conditions exist, nontraditional high consumption patterns tend to replace the older ones. Not only is there increased consumption of traditional goods, particularly traditional luxury goods, but supplementation of those goods (especially foods) by those common to all industrial countries.

Herman Kahn, using the techniques of simple trend extrapolation, predicted that by the year 2000 Japan would assume leadership of the developed world.* In such case, one would expect to see a continued evolution of its societal forms in response to the stresses of accelerated economic growth. However, it now seems clear that the natural resource limitations of Japan make this future unlikely. Since the process of adaptation of societal form in Japan is well-advanced and expresses heightened expectations for the future as well as accomodation with the present, it is of great interest whether or not these existing forms will be adequate to a period of slow growth, no growth, or even decline. If not, it remains to be seen if the Japanese will revert successfully to the forms which were suited to their past, adapt present norms to changed conditions, or undergo severe social breakdown.

Surely, the ethnic homogeneity and cultural identity that gave to Japanese growth its sense of national purpose and stable character remain.

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*Herman Kahn, The Emerging Japanese Superstate (Englewood Cliffs, N.J., 1970); Kahn and Briggs, Things to Come, 232 ff.

However, given that the traditional social forms that have been retained are more or less artificially nourished without being rooted in necessity, and that the new forms and adaptations of the old embody specific responses to the necessities of growth and the opportunities of prosperity, the viability of traditional social forms is open to question. One obvious example is the life career of guaranteed employment within a single firm. Will this system be retained during a period of severe retrenchment? If the implied contract embodied in this system is the social cement that holds industrial Japan together, and if it is breached, the result will be an important and significant trend break.*

The United States

If Japan provides the most distinctive example of the adaptation of a traditional society to the norms imposed by advanced technology, the United States stands forth as the model of the nontraditional society which has originated and most fully evolved the advanced technological norms to which others have, in one form or another, and with greater or lesser success, adapted. Assuming that for the remainder of the twentieth century the United States will continue in the role of leader and exemplar, an examination of possible societal trends in this country is essential to any global forecast.

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*An indication that this trend is breaking can be found in recent press reports. E.G., "Japan Cuts New Employees," Christian Science Monitor, February 12, 1975, p. 3d. This report notes: "Although the number of such cases is...relatively low compared with other industrial nations, such layoffs or terminations are a drastic change in Japanese business practices...."; "Japanese Companies Plan Cutbacks," Wall Street Journal, March 5, 1975, p. 6; "Japan: An Economic Threat to Lifetime Jobs," Business Week, March 24, 1975, p. 46; Don Oberdorfer, "Japanese Soft Touch on Layoffs," Washington Post, March 9, 1975, p. G1. Oberdorfer notes that Japan's current 1.6% unemployment rate masks serious underemployment and significant withdrawal from the labor market. At the same time, the extent of employer determination to support the system is emphasized by a Toyo Kogyo spokesman who says that only in the event of imminent bankruptcy would the firm fire employees.

The juxtaposition of Japan and the United States provides emphasis for the contention that no matter how great the differences between societies, the successful implementation of policies of corporate free enterprise economic rationalization results in a sinking of those differences in societal forms that resemble each other far more than they differ. The continental United States, relatively underpopulated, possessed of unequalled amounts of arable land, fresh water sources, a benign climate, vast quantities of minerals and fuels is in sharp contrast to small, crowded, resource-poor Japan. There is a historical resemblance, though, in that each pursued, until comparatively recent times, policies of isolation and studied non-involvement in the affairs of other nations. Yet there is also an important difference. Japan, until forced to do otherwise under the threat of Perry's guns, not only did not venture forth but refused to let others enter. The United States--which ironically and uncharacteristically forced Japan out of its seclusion--while noninterventionist, was never isolationist. From its inception the United States encouraged immigration, and from the earliest days of settlement Americans consciously adopted the pose of model for the rest of the world. From the time of the Puritans' deliberate creation of their "City on a Hill" in the New World down to the Second World War, Americans very seriously believed that the society they were building was one which all other peoples of the world should and eventually would emulate.

To a very startling degree--especially since World War II--and through a variety of means ranging from exhortation to subversion, the United States has adopted an activist missionary policy and has succeeded in great measure in achieving the goal it once sought to reach by example. The industrialized world and the modernized sectors of developing nations have, in the catchphrase, become coca-colonized. Even Eastern Europe and the Soviet Union, against the will of their governments, have been influenced.

Basic to this analysis is the postulate that the population/resource ratio is the ultimate determinant of societal form. It is, therefore, not surprising that the United States, in which this ratio has been most favorable throughout the whole period of its technological development, consistently has been the societal trend leader. Such a flat assertion does not overlook the importance of qualitative factors--the absence of crushing tradition, the egalitarian spirit, the elevation of the work ethic, and so forth--in the American experience. It is only to point out that the physical conditions of the United States gave fullest scope to these moral impulses. It is even more important to emphasize, as has every thoughtful observer of the American scene since de Tocqueville, that the people of the United States have been, in response to their material abundance, enthusiastically materialistic.[*] There has never been need in the United States for the materially frustrated to seek refuge in or to rationalize spirituality. It is surely no accident that during the late nineteenth century when American capitalists were voicing variations on the theme of "the public be damned," the humanistic ideology of European socialism ran aground in America, as Daniel De Leon put it, on "shoals of roast beef" and that Samuel Gompers would express the goals of American organized labor in the single word "more."

Another result of American abundance--interpreted as personal rather than community opportunity[**]--was the growth of individualism. Rather than list all the manifestations of American individualism in a historical context, the following is offered as a partial list: the isolated farmstead instead of the village; the single-family home suburb; the fragmentation of

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[*] Oddly enough, Kahn and Briggs in Things to Come do not include the term materialistic (or acquisitive) in their listing (on page 90 of the book) of 70-odd social and political ideologies emphasized in the United States. Neither does the word competition appear.

[**] Both at Jamestown and Plymouth the early settlers, even though they were technically shareholders and/or employees of corporations formed to work their grants as plantations, went on strike, as it were, for the right to work as individuals. Later attempts to use the public lands of the new United States as a public resource were overwhelmed by the Free Soil movements of the Jacksonian era. Arthur Bestor, in his classic study, Utopias in the Wilderness, chronicles the manner in which communitarian groups organized in Europe fell apart when transported to the United States.

the extended family; the near-cult of the private possession of firearms; and the rejection of public transportation in favor of the private automobile. While in Europe the doctrines of Social Darwinism were employed chiefly to justify the expansion of empire over nonwhite peoples, in the United States these doctrines were welcomed primarily as scientific support for the practice of all out individual economic competition among members of the same society.

Even as industrialism produced collectivization of enterprise in the modern corporation, American law identified the corporation as an individual and its directors employed all the rhetoric of individual enterprise. For a long period of time the fiction of individual labor contracts between the single worker and the massive collective enterprise was used as an argument against the organization of unions.

In practice, American society has long since come to terms with the reality of modern economic organization. However, the rhetoric of individualism lives on. Its most effective expression is in the persistence of individualistic patterns of consumption and consumption-related lifestyles. The advertising-supported preference for individualism in consumption has led, as John Galbraith and others have noted, to relatively little spending on community needs as compared to that on private wants.* Most importantly from the societal point of view the individualistic ideal. even while permitting a healthy and attractive pluralism in tolerated lifestyles, is relatively intolerant of restrictions, particularly on consumption, in the interest of any abstract common good.

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* See also Daniel Bell, "The Coming of Post-Industrial Society," *Business and Society Review/Innovation*, Spring, 1973, p. 12, for a sociologist's interpretation: "...the value system of American society emphasizes, as the primary consideration, the satisfaction of individual private consumption; the result is an imbalance between public goods and private goods. In the popular psychology, taxes are not considered as the necessary purchase of public services that an individual cannot purchase for himself but as money 'taken away from *me* by *them*.'"

The basic societal question facing America in the years ahead is whether or not the current life style, based on increasing individual consumption of more and a greater variety of goods, will continue. It is becoming increasingly clear that it cannot do so if there is reliance solely on the raw materials available within this country. Even if the type of postindustrial future predicted by Daniel Bell and others[*] evolves during this period, with more and more Americans finding their livelihoods in service and "knowledge" industries, it is questionable whether the increasingly automated and cybernated primary and secondary industries that employ fewer and fewer of them will be able to produce any great increase in the _per capita_ availability of individual goods. Bell recognizes this point implicitly in his previously cited article in _Business and Society Review_. Whether a majority of Americans realize it or not, the superabundance that has permitted the individualist materialistic ethic in its present form to persist in the United States is a thing of the past.

One trend that might evolve in response to this change in basic conditions is the continuation of existing societal patterns but on a reduced scale. Some examples are: adherence to the private automobile in a diminished form, the lightweight small car replacing the standard model; continuation of the isolated nuclear family housing pattern but with fewer children and with the condominium-apartment replacing the detached suburban house as the ideal of the home; possession of a wide variety of high-technology products but with more emphasis on reliability, durability, and economy than on novelty. Whether such changes are compatible with an industrial, growth-oriented economy based on high levels of saving and investment and supported by the willingness of consumers to borrow against future earnings is questionable. However, it would permit the continuance of the individualist materialist ethic, a diversity of individual lifestyles, and emphasis on personal as opposed to community concerns.

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[*] Bell, _The Coming of Post-Industrial Society_ (Basic Books, New York, 1973); Peter Drucker, _The Age of Discontinuity_ (Harper and Row, New York, 1968).

Much existing evidence lends support to the probability of this trend. Changes in the automobile industry,[*] the startling decline in the birthrate, the near-collapse of the traditional home building industry and the concurrent condominium boom, and the rise of the consumer movement all can be interpreted as evidence of rapid societal adaptation to reduced abundance.

On the other hand, perhaps this evidence merely indicates a temporary belt-tightening on the part of a society whose long-term trend will be a resumption of high-growth, high-consumption-related patterns. Possible breakthroughs in energy technology; the establishment of a world political order that guarantees the United States access to global resources on terms permitting a continuation of accelerating industrial growth; the psychological inability of Americans to adjust to a more frugal lifestyle; the sense that quantitative economic growth in and of itself is a necessity for national survival; all could contribute to a strong effort--regardless of political and environmental costs--to preserve the "American Way of Life."

Once again, there is contemporary evidence that the development of this trend is very possible. There has been more or less explicit speculation by public officials on the justification for seizing by force raw materials which underdeveloped countries refuse to deliver on satisfactory terms; insistence that the provision of jobs takes precedence over preservation of the environment; interpretation of "national security" in terms of a continuation of a marked differential in consumption levels between America and the rest of the world; and political competition based on appeals to individual self-interest.

Of special significance in regard to the probability of either trend (or variations thereon) is the demonstrable aging of the American population. The United States has long been characterized as a young country. This is not to say that in the twentieth century there has been a markedly greater percentage of young people in the U.S. population than in the other industrial nations. Rather, it is in the special attention given to youth and the elaboration of a youth culture which distinguishes the United States. Indeed, it has been through export of this youth culture that the United States has had its most visible impact on societal patterns worldwide.

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[*] See, Emma Rothschild, Paradise Lost: The Decline of the Auto-Industrial Age (Random House, 1973).

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Now, however, as the dramatic decline in birthrates reveals, the youth tide has peaked. Increasingly, the elderly population is identified as a primary object of social concern. Increasingly, the taxpayers' burden is shifting from support of public expenditures for schools and the welfare system--whose chief beneficiaries are women and their offspring enrolled in the Aid for Dependent Children (AFDC) programs--to support of the social security system.*

There are many societal manifestations of this shift in the demographic balance in the American population. Most significant is the reversal of the flow of acquired wealth from the older generation to the younger. Now the more numerous and longer-lived elderly are surviving to consume their own savings and then, as the social security debate reveals, calling on the earnings of the younger generation. Furthermore, the potential consequences of this in terms of family organization, housing patterns, employment, education, and so forth are unclear. Several possible societal responses include the likely re-creation of the extended family.** In general, though, it seems reasonably certain that an aging population will be more conservative, less concerned with economic growth, and, for simple physiological reasons--if nothing else--less consumption-oriented as well as less productive. For example, the old eat less and being less fashion conscious they tend to keep their clothing longer. In short, an aging population would find it more natural and less difficult to adopt the modes associated with more frugal, reduced scale trends.

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*"Will the Social Security Bubble Burst?", Nation's Business, November, 1974, 28 ff.; Amitai Etzioni, "Zero Population Growth: Do We Really Want It?", Evolution, Summer, 1973.

**Congressman Paul McCloskey, in a discussion held at Menlo Park, California, January 18, 1975, urged mayors of cities in his district to relax zoning laws to allow addition of separate living quarters to single family homes so that elderly parents could live with their grown children. He believes that the economy can no longer afford to provide separate housing for the rapidly increasing numbers of the aged.

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Even though the argument for this possibility is strong on a per capita basis, it must be pointed out that concurrently the human products of the post-World War II baby boom have now entered the mainstream population as young adults. This age group (25 and over) is typically associated with the high individual consumption pattern. Although individual food consumption tends to decrease from the peak intake years of adolescence, it is the demands of this group for housing, household furnishings and appliances, and individual automobiles that should, if typical consumption patterns are maintained, tend to increase overall consumption. Thus, it might be argued that over the next 15 to 20 years, at least, the trend of maximum individual materialism will be stronger than the countertrend toward frugality.*

This particular demographic sword may cut both ways. It is notable that the current young adult generation has shown strong signs of reaction against the societal patterns accepted by their parents. The very process of family formation is altering visibly. Much of the high consumption attributed to young adults in the past has been associated with the creation of family living arrangements that required as a social necessity the purchase and use of many goods. For instance, the family-size sedan or station wagon was seen as a necessity and often purchased in anticipation of the arrival

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*See, Ben J. Wattenberg, The Demography of the 1970s: The Birth Dearth and What It Means, cited in "If You're a Businessman, This Chart May Be the Shape of Your Future," Forbes, September 1, 1974, pp. 37-44. Wattenberg predicts that in 1985 Americans will spend (in 1968 dollars) 19% more on food and drink; 95% more on clothing; 107% more on transportation; 110% more on home furnishings; 149% more on education and recreation; 172% more on housing; and 185% more on personal and medical care.

of children. The same rationale lay behind the perceived need for the multibedroom house with "family room." Whether the current generation of young adults sees the good life--the "American Way of Life"--in the same way as their immediate predecessors or whether their concept is different in any important respects is, more than any other single factor, of greatest significance in determining the trend of American society during the next 25 years.[*]

Western Europe

Western Europe, including the United Kingdom and the Scandinavian countries as well as, to a somewhat lesser degree, the Iberian peninsula, Greece, and Yugoslavia, represents a third variant of societal development under high technology, industrial growth conditions. However, especially during the post-World War II years, the differences between European societal patterns and those of the United States narrowed considerably. As in the case of Japan this phenomenon seems to demonstrate that regardless of history and culture the successful achievement of a high technology economy tends to result in the evolution of essentially uniform societal responses.

The most noticeable trends in postwar Europe have been those toward high consumption individual materialism and the adoption of societal forms most amenable to that style of life. Throughout the European countries traditional class and religious institutions have lost influence. Furthermore, the Common Market and the practice of labor recruitment by the more prosperous areas has to a great degree broken down national economic boundaries.

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[*] See, Zbigniew Brzezinski, "Recognizing the Crisis," *Foreign Policy*, Winter, 1974, pp. 63-74. This conservative political analyst expresses grave doubt over "the ability of modern democracy to operate effectively in the absence of sustained economic growth." He is unconvinced that such growth is possible, stating (p. 71): "To preserve their democratic institutions, all democratic governments will have to undertake long term programs for redistribution of domestic burdens and for promoting social justice in the context of slower growth rates. In the past our democratic institutions worked because social conflicts were mitigated by higher growth rates. In their absence longer term programs of social distribution will be required if our democratic institutions are to survive."

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Such familiar manifestations of the individualistic high consumption trend as emphasis on individual home ownership, possession of the private automobile, reduction in family size and--most significant--official acceptance and encouragement of contraception and abortion as the means of reduction, the widespread use of consumer credit (in Britain the "never-never"), the extension of the years of required formal education and the availability of higher education to wider segments of the population, and the rise of the youth culture are indicative of what has occurred. Much of the so-called economic miracle of Europe over the past two decades has been based in this more of less conscious imitation of American modes. Indeed, Jean-Jacques Servan-Schreiber, in The American Challenge, argued (at least in the context of business management) that unless the imitation became more conscious and more rapid, Europe would have to submit to American direction. His more philosophic countryman, Jean-Claude Revel, in Neither Marx nor Jesus, claimed that the forms of the future world society were developing in the United States and would, perforce, have to be adopted everywhere as a matter of historical inevitability.

Nevertheless, while disposing of outmoded forms to embrace the individualist materialistic patterns typical of the United States, Western Europe has retained and elaborated a more community-oriented approach in the areas of social welfare and has been the leader in developing new modes in the social organization of industry. This last is especially true in the Scandinavian countries, in West Germany, in Yugoslavia, in France and, with a more traditional Catholic orientation, in Italy. While in the latter country the emphasis is on a more or less paternalistic concern, in the former countries there has been a studied effort to provide for more worker participation in decisionmaking and in establishing the goals for enterprise, and for establishing worker (as distinct from labor union) control over the organization of the production process.

With reference to the basic and controlling conditions of a population growth and resource availability, Europe (with some exceptions) has achieved population stability with its concomitant of expanding the percentage of the aging. More than is generally realized Europe (including the United Kingdom)[*] is nearly agriculturally self-sufficient. European grain imports, for instance, go largely for the feeding of livestock to provide the greatly increased amounts of meat in the recent European diet. The meat itself, however, is produced almost entirely in Europe. The great bulk of European agricultural imports are of tropical fruits, sugar, coffee, tea, tobacco, and other dietarily nonessential products. Furthermore, (the United Kingdom excepted) most European countries have, as a matter of social policy, resisted the so-called rationalization of agriculture in order to preserve relatively large numbers of farm families.[**] The system of agricultural subsidies, especially in France and West Germany, keeps food prices relatively high for city dwellers but serves important social and environmental purposes as well.

The ability of societies to adopt new or adapt old forms to deal with changed conditions has, in this analysis, been related to the extent of ethnic, class, and cultural identity which they possess. Europe viewed as an entity might appear totally fragmented with regard to all three of these factors. Indeed, a history of four centuries of war and revolution would support such a conclusion. However, a longer history of common cultural identity has endured through these same centuries. Furthermore, the very process of nationalism that intensified internecine European struggle in the first half of the twentieth century had as one of its very important results the solidification of the sense of community in each nation. Another result of the

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[*] See, Kenneth Blexter, FRS, "Can Britain Feed Herself?" New Scientist, March 20, 1975, pp. 697-702.

[**] By 1970 U.S. farmworkers were only 4% of the labor force. In West Germany and France the percentages were 11% and 18% respectively. (George Katona, Burkhard Strumpel, Ernest Zahn, Aspirations and Affluence: Comparative Studies in the United States and Western Europe, McGraw-Hill, 1971, p. 20).

centuries of struggle has been the exhaustion of many of the religious and political issues that once divided Europeans. A further unifying factor, ironically, has been the shared experience of disaster. Europe's still active leadership was born in the shambles of the first World War, raised in the chaos of postwar inflation and revolution, experienced the paralysis of the Great Depression, and matured during the second World War. The leadership as well as the people of Europe have enjoyed the recent halcyon generation of peace and prosperity but, unlike Americans (the "People of Plenty" in the late David Potter's phrase), are more likely to view the period not as something normal and theirs by right but more as a happy aberration. This being the case, it is possible that the European societal pattern, viewed as a function of high consumption individual materialist opportunity, is less rigid than that in the United States and will be more easily adapted to conditions in which that opportunity is restricted.[*]

The basic European societal trends over the next quarter century then, as in the United States and Japan, will be adaptation to circumstances in which the availability of raw materials for industrial consumption will probably diminish; the population will remain essentially stable; and the percentage of youth will diminish while the percentage of the aged will increase. Under these conditions, it is probable that Western Europe will no longer require the amount of labor it has used during the period of postwar economic expansion. Thus, as the recent Swiss referendum on the subject (even though it was defeated) indicates, there will very likely be a tendency toward reduction in the use of migrant labor imported from Turkey, Algeria, Yugoslavia, Portugal, Spain, and Black Africa. Not only will this trend, if it occurs, remove from Europe an exotic element affecting in various ways the overall societal patterns of the continent, but it will require that Europeans themselves resume the performance of many of the

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[*] The Christian Science Monitor, December 11, 1974, 1, reports that the Common Market countries have reduced petroleum consumption by 10% during the past year while the United States has reduced its own by only 3%.

low-skill production and service tasks that immigrants currently carry out. In turn, the Europeans who replace them will have to reduce their own expectations for lifestyle and consumption level.

As discussed above, the European nations, largely because their society-wide experience with high consumption individual materialism on the American model has been so recent and so tempered by still live memories of past privation and disaster, probably have not developed an ingrained commitment to the values associated with it.[*] Additionally, in one form or another, the communitarian ideal (expressed in more tightly disciplined, interest-oriented political parties, property laws, institutions [including churches], social security systems, and so forth) is more fully a part of the varying national traditions in European countries than in the United States and provides a more familiar alternative to individualism during times of stress and transition. Of special importance from the environmental point of view is that the need to conserve land and other basic resources is built into European tradition and practice. Consequently, recent trends toward lack of environmental concern in the interest of growth and high consumption may be reversed more readily.

Hence, just as the United States has provided the leadership for societal development during the period of industrial age affluence and growth, so the Western European nations may provide, if not leadership, then lessons in societal pattern adaptation during a period of evolution toward low growth, reduced expectations, and diminished material consumption.[**]

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[*] Katona, et al., Aspirations and Affluence, p. 41 ff.

[**] Katona, et al., Aspirations and Affluence, p. 79. "Exposure to the hazards of changes in business conditions is more real in the United States than in most European countries where unemployment has virtually become a thing of the past and job and old age security are more effective." See also, "Erich Jantsch Interviewed by G.R. Urban," in Alvin Toffler (ed.), The Futurists (Random House, New York, 1972) p. 231-232.

Eastern Europe and the Soviet Union

To discuss societal trends in the United States and Western Europe (and, to a somewhat different and lesser extent, in Japan) is to speculate on the manner in which the microdecisions about lifestyle adopted by individuals and supported by government are responded to as well as stimulated by business organizations. There is a presumption that within the scope provided by the level of technology, the availability of raw materials, and the number of people, individuals or groups within essentially pluralist societies will themselves determine what societal patterns will emerge.

In the Soviet Union and Eastern Europe, on the contrary, the presumption is allowed that within the same set of constraints the government, i.e., Communist Party leadership, will dictate to a very great extent the permissible societal forms. To differentiate more precisely, it might be said that if the United States is a society whose forms are functions of almost uninhibited adherence to the ideal of high consumption individualistic materialism, and that Western Europe is a society whose adherence to that goal is tempered by a tradition of greater concern for the community viewed as something more than the sum of its individual members, then the European communist states might be described as having policies of governmentally controlled individual consumer choice which tend to control consumption at a relatively low level in the interest of overall national development along predetermined lines.

This is not to say that the general trends associated with industrial development have not been visible within the Eastern Bloc countries. Marxism-Leninism, after all, is a major variant of industrial society and shares with it an overall bias toward maximum production. Its dominant philosophy and tradition is overt materialism. It displays such common elements of industrial societies as low birth rates, urban growth, extended and universal education, and a system of meritocratic social mobility.

On the other hand, it is important to recall that, as a variant, it rejects pluralism, individualism, and choice expressed through the market.

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Insofar as they are able to be so, the governments of European communist states are nonresponsive. The drive is to control social and economic choice in order to allow the imposition of a planned program of social and economic development.

With regard to the constraining contextual factors of resource-population ratios, especially when considered together with present levels and types of consumption and the ability of government to control them, it is at least arguable that these states have developed societal institutions well suited to the exigencies of a period when declining shares of resources and the realization of entropic limitations have become major considerations. Their populations are stable, and, although less climatically favored than either the United States or Western Europe and having, especially in Russia, a lesser percentage of first class agricultural soils, they possess very adequate land and water resources. Indeed, the very adequacy of these resources and the opportunity they have presented to individual farmers has been a major factor inducing resistance to collectivized agriculture with consequent low production. However, many recent news reports indicate that increased investment in agriculture combined with growing levels of experience and familiarity with the collective system are showing results. Indeed, many of the agribusiness techniques and technologies developed in the United States seem tailored to application in Eastern Europe.*

Additionally, Eastern Europe, especially Asiatic Russia, possesses enormous and comparatively untapped natural resources. Timber, petroleum, natural gas, minerals, and other raw materials in short supply in Europe and North America are comparatively abundant in Eastern Europe. Russia, for instance, in 1974 replaced the United States as the world's leading producer of crude oil.

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*U.S. Department of Agriculture Economic Research Service data show food production _per capita_ in the USSR increasing by 1973 by about 50% over the 1961-1965 level and that of Eastern Europe by about 30% compared to about 17% in the United States and 10% in Canada.

These circumstances, combined with the above-mentioned ability of East European governments to control the levels and types of individual consumption, indicate that despite the inefficiencies and waste associated with nonmarket economies the European communist nations will be able over the next quarter century to maintain a steady, if slow, economic growth trend. Consumption levels will probably remain low compared to the more favored nations and population strata in the West, but the absolute gap--especially in food and fuel consumption--will tend to close.

In societal terms such development will be expressed in continued urbanization but without suburbanization. Growth of traditional centers will be limited, but major new cities organized on advanced urban planning principles will continue to appear in the currently less developed regions, as in Kazakhstan and Siberia. Reflecting both the ideological bias against individualism and the rationally derived need to conserve finite fuel supplies, mass public transit and reliance on rail and canal long distance transport will continue to characterize the East European surface communications system.

Housing for the urbanized majority of East Europeans (and, increasingly, for rural residents, as well) will continue to be the apartment in massive blocks of flats. Increasingly, these will be supplied with amenities--refrigerators, television sets, better furniture, etc. However, again reflecting the anti-individual bias, the personal telephone will not be among these amenities.

Families of the conventional sort will continue to be the unexceptionable rule. Experimentation in family organization will not be tolerated. Since geographical mobility, except for the migrants selected to populate new towns and the meritocratic elite who, on the basis of selection through educational performance, move into directing levels in the political, administrative, and military hierarchies, will continue to be limited. Multigenerational, extended families will be much more common than in the West.

This arrangement eases the child-raising burden on the nuclear family and will permit, as it tends to do now, the near full employment of adult women.

Contrary to theories current a decade or so ago, the trend toward higher levels of consumption, which will continue in Eastern Europe during the rest of the century, will probably not produce any trend toward political liberalization. This is not to say that the machinery of social control will not be employed more subtly and with less brutality than has been the case in the past. Rising community affluence will play its part in stifling dissent, and dissenters who appear to be rocking a comfortable boat will be less tolerated by the mass of the population. Furthermore, since the gap between living standards in the West and East--measured in terms of access to food, housing, clothing, and other subsistence goods--will be narrowing and the lack of individual liberty can be interpreted as necessary for continued material progress, there will be more popular adherence to the regimes.[*]

Overall, the next generation in Eastern Europe will be marked by societal stability under conditions of slowly increasing affluence for the general population.[**] The potential for intense sociopolitical clashes or for serious disruption of existing societal patterns and modes, unlike the situation in the West (especially in the United States), is small. Despite the distasteful aspects of anti-individualism and authoritarianism, the Eastern European model will have an increasing appeal to the marginally affluent and industrialized nations of Southern Europe--Greece, Turkey, and,

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[*] The recent massive wheat purchases of the Soviet Union can be and are seen by many in the United States as evidence of continuing agricultural failure. However, the fact that the decision was made to purchase grain instead of, as in the past, requiring the public to tighten its belt can be viewed as evidence of overall economic success.

[**] Even Herman Kahn (Things to Come, p. 63) identifies Eastern Europe as one of what he calls the "five dynamic areas" of the world during the rest of the century.

possibly, Italy and Portugal. The possibility of new Cubas* in the Mediterranean should not be discounted. The probability of the inevitable spread of this model throughout the West is the theme of Robert Heilbroner's *An Inquiry Into the Human Prospect*. He believes this will occur as a consequence of the inability of the industrial system to continue to function under conditions of raw material shortage and ecological limitations without resorting to authoritarianism, denial of free choice, and, even, denial of free thought.

Developing Countries--The Middle East

The societal trend prospect for the remainder of this century in the already industrialized countries, then, would seem to be one of adjustment to the limitations on economic growth and increased consumption imposed by decreased resource availability on the one hand and environmental inability to absorb industrial side effects on the other. The societal effects will appear greatest in the United States where institutions have reflected expectation of unlimited growth and affluence. In Europe, where still viable traditional institutions incorporate less of such optimism, the adjustments will be carried out with less trauma and impose fewer visible changes. In the Communist countries of Eastern Europe, where the institutions of scarcity economics are already firmly in place, societal change will be minimal. In all three instances, however, change will take place against a background of existing high level industrial and technological development and a context of the already established societal patterns and institutions associated with this level of development.

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*On Cuba see, e.g., Theodore Draper, *Castroism: Theory and Practice* (New York, 1972); Edward Gonzalez, *Cuba Under Castro: The Limits of Charisma* (Boston, 1974); Ted Morgan, "Cuba: Revolutionary Rags to Socialist Riches," *New York Times Magazine*, December 1, 1974, pp. 27 ff.; and, "Sweeter Times; Cuban Economy Gets Moving...," *Wall Street Journal*, December 16, 1974, p. 1.

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The situation is quite different within the underdeveloped world. As stated in the introductory paragraphs of this analysis, the experience of the nonindustrialized countries over the next few decades will vary widely in each in relation to the holdings of natural resources for either industrial or agricultural development, the population--considered both quantitatively and qualitatively, and the cultures. Some of these countries may be expected to enter the ranks of the developed nations and undergo pervasive and revolutionary societal change. Others will experience merely an expansion of the modern sector with, depending on particular circumstances, the traditional sector experiencing only minor change or suffering severe disruption. In other cases, the modern sector itself will collapse with, again depending on individual circumstances, the traditional sector providing viable societal patterns or itself collapsing under conditions of general turmoil.

The most obvious candidates for the first class--the leap into development--are the Arab countries and Iran. In both instances, the preconditions of resource possession in sufficient amount, relatively low resource/population ratios,* and ethnic-cultural unity are present. Nor is resource possession limited merely to petroleum reserves. To a far greater extent than is commonly realized, the Arab countries are agriculturally self-sufficient. This self-sufficiency is even greater in potential when the reserves of fertilizer, implicit in petroleum and natural gas and explicit in the phosphate deposits of Morocco, are considered.

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*Egypt and Algeria, with their respective populations of 40 and 15 millions and their high birth rates are exceptions. However, Algeria's exceptionally large reserves of petroleum and natural gas and Egypt's resources in trained manpower are partial compensation. In any case, the strong possibility exists that national boundaries in the Arab Islamic world do not preclude a program of regional sharing in Allah's bounty. The decisions on mutual economic assistance taken by the Arab states at Rabat in November, 1974 are evidence at least of good intentions.

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Consideration of policy declarations and draft programs for economic development in the Arab world (the old Caliphate) and the hard evidence of events in Saudi Arabia, Libya, Egypt, Algeria, and elsewhere in the Middle East and North Africa (and separately but similarly in Iran*), leads to the conclusion that the process of industrial development is well underway. Not only are these states able to utilize capital in the form of foreign exchange which they have amassed with unprecedented rapidity from the sale of oil at bonanza prices, they have also been able to draw on trained manpower reserves within Western nations as well. Very importantly (unlike the nineteenth century experience of Latin America and parts of Asia) they are also able to employ large numbers of indigenous technicians and administrators trained in the West; teachers, physicians, engineers, and scientists who have been working in the West are now returning to the Middle East. Similarly, skilled Moslem professionals and workers from Pakistan, Bangladesh, and India are emigrating in significant numbers, to the Persian Gulf emirates in particular. Egypt, with its surplus of underutilized trained manpower, also provides important additions to the technological labor pool.**

It must be emphasized that (the Europeans and North American contingents aside) these skilled elites are committed to the idea of Arab renaissance. There is little of the foreign orientation of, say, the Argentine beef barons of yesterday whose goal was to be able to live and die in Paris. The old set of Arab puppet leaders--the Farouks, Isdrises, and Hashemites--who owed their thrones and privileges to Western support and whose taste for

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*See, Dana Adams Schmidt, "Shah Strives for Grandeur in Iran," Christian Science Monitor, February 11, 1975, p. 1.

**"Middle East: Now Foreign Workers Rush to the Oillands," Business Week, March 17, 1975, p. 36: "...the oil states are trying to get their own skilled nationals to come home. Some 3500 Saudi doctors, engineers, and others are in Europe and the U.S. West Germany alone has 1,250 Iranian doctors and 800 highly qualified Iraquis."

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Western-style high consumption implied a rejection of Islamic culture--have been replaced by men like Khadaffy, Boumedienne, Sadat, and others. These men, like the royal rulers of Saudi Arabia with whom they often disagree ideologically, are committed to puritanical Islamic ideals and the Arab culture.* Although Iran and its Shah must be considered apart, that nation and its leader also represent a commitment to an indigenous tradition and ideal which precludes the idea of the controlling group's seeking stature and fulfillment through identification with "the advanced nations," or, more crudely, being accepted as "white men."

A further aspect of the situation affecting the societal patterns that may emerge in the Arab world lies in Arab perceptions of the relative worth of West European/North American, high consumption, individualist models and East European, controlled consumption, collectivist, authoritarian models. Despite the aversion of Islamic leadership to the atheism of East Europe--evidenced by, among other things, the heavy handed suppression in all Arab countries of Moscow-supported Communist parties--the modernization of the former Muslim areas of the Soviet Union (Soviet Turkestan, Uzbekistan, and Kazhakstan) has for years impressed the Islamic world. The unstinting military and political support given by the Soviet Union to the Arab nations since the Suez crisis of 1956 has not been unproductive of influence, either. The image of sybaritic sheikhs to the contrary, the odds seem to favor adoption of societal patterns foreshadowed by the experiments of Nasser, of Boumedienne, of Khadaffy or, even, of the White Revolution of the Shah--whose ability to abandon the role of playboy potentate has infuriated his onetime Western sponsors to the point where the American Secretary of the Treasury could be moved to refer to him in public as "a nut."

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*An Arab counterview claiming failure of current leadership to share the oil wealth is Fawaz Turki, "Who Owns That Arab Oil?", Christian Science Monitor, July 1, 1975, p. 27.

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It therefore seems likely that the societal patterns emerging over the next quarter century in the Arab world and in Iran will have more attributes of the Eastern European collectivist, controlled consumption model than they will of either the West European or North American individualist, free choice, high consumption model. Of course, these patterns will be influenced enormously by the Islamic tradition. For example, women will tend to remain in a distinctly subordinate position. Also, religion will remain central to cultural life with such expressions as the Radadan fast, the pilgrimage to Mecca, and abstinence from alcohol as prominent manifestations.

Nevertheless, urbanization, industrialization, extended education, and governmentally controlled systems of social security and welfare along lines common to both East and West will emerge imposing their own societal restraints. Agriculture will tend to be collectivized, probably through the device of state cooperatives built on the base of existing rural communities and created in new regions where land is reclaimed. Uncontrolled city growth will be prevented through policies of restriction on individual geographic mobility as well as through the creation of new population centers and the dispersion of industry. Traditional forms of family organization will be the norm. Experimentation with lifestyles incompatible with the Koran will not be permitted.[*]

Although the Arab countries--particularly Egypt--have been notorious for high population growth rates in recent years, the probability is for a reduction in population increase, tending toward stabilization by the end of the century. The development of state social security and the rationalization of agriculture will tend to vitiate the rural family's need to have many children for the assurance of support in old age and for labor on the farm. Increasing levels of education, combined with the acceptance of state

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[*] On Algeria as exemplar, see Georgiana G. Stevens, "Algeria's Onrush to Modern Statehood, Independent of West, Before Oil Runs Out," Christian Science Monitor, January 2, 1975, p. 5.

planning in the economy, will also conduce toward more effective family planning and limitation of births. Most importantly, the Islamic tradition supports limitation of births. The Koran says, "The worst hardship is to have many children and inadequate means." Also, the institution of polygamy serves as a traditional means of limiting births. Although the laws on contraception and abortion are diverse in the Arab countries, both measures are practiced--legally and illegally.* Finally, since (again with the exceptions of Egypt and Algeria) population pressures on resources are not currently critical in the Middle East and North Africa, there is time for initiation and acceptance of effective population policies. For at least the next twenty-five years, the societies of the Middle East will not have to cope with any problem of the aged.

There will very likely be some wide variations from this societal trend forecast. Lebanon, for instance, with its mixed Muslim and Christian populations and its close identification with Western Europe, will probably mirror European trends. The mini-states of the Persian Gulf--Kuwait, Abu Dhabi, Oman, etc.--may, if the politics of the area permit, and their rulers allow their foreign economic relations to be controlled by their large neighbors--develop along North American-style, high consumption lines. Like Macao and Hong Kong surviving as capitalist pimples on the body of China, or Singapore attached to Malaysia, they will not be forced to conform to the frugal, controlled consumption standards of the larger Arab states. Given the amount of wealth and the social traditions of the Middle East, it is also probable that a fairly conspicuous but small high consumption social sector will persist in such nations as Iran, Egypt, and Saudi Arabia. However, this sector will not, and will not be perceived as, existing at the expense of the larger society.

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* Gail Shiner, "Moslem Nations: The Koran Forgotten," Atlas (Special Issue on Abortion), November, 1974, p. 16; Also, Report on Tunisia, Law and Population Program, Fletcher School, Tufts University, People, January 4, 1974, pp. 38-39.

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Developing Nations--Africa

Africa, excluding the peculiar Western outpost of South Africa which probably will survive in something like its present form during the remainder of the century,[*] will represent a very broad variety of societal trend possibilities. The overall picture is further complicated because most of the African states--regardless of whether, like Zaire or Nigeria, they are fortunate enough to possess natural resources in sufficient quantity to support programs of national development of any significance--are so fragmented internally along ethnic, cultural, and linguistic lines as to almost guarantee the sort of political instability that will prevent the creation of strong, coherent societies.

The states of the Sahal, arid and climatically disfavored regions, will most likely continue in their marginal condition of nomadic pastoralism mixed with subsistence agriculture in the least desirable arable regions and plantation or export agriculture in the better farming areas. Societal patterns will be, for the most part, analagous to those of reservation Indians in the United States. The vast majority of the people will cling to debased traditional tribal cultures. A miniscule and superficially modernized elite will control (and quarrel over) whatever small surplus is produced. Should any significant sources of valuable minerals or fuels be found within their territories, the controlling elites will seek to exploit these resources for their own benefit with the aid of the highest bidders among foreign concession seekers. Alternatively, should the deposits be of major importance, these states might be taken over by more powerful and better organized neighbors, especially if the deposits are in border areas. In either case, the lives of most people in the region will be little affected.

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[*] The future of Rhodesia is less sure. The experience of Kenya, and more recently, of Angola, Mozambique, and Portuguese Guinea, argues against the long term viability of minority white rulership anywhere in black Africa.

The countries along the west coast of Africa, roughly speaking from Senegal to Dahomey, are small in area and population. They are, for the most part, near classic examples of plantation states. Providers of a wide variety of tropical goods--cacao, hardwoods, rubber, etc.--and minerals to the world market, they have highly rationalized plantations, mines, and other industries controlled by foreign investors. Their capital cities are the ports from which these goods reach the world and are modern enclaves--home to a local elite, an affluent foreign population, and masses of urban poor, who every year swell the overcrowded slums and shantytowns. Away from the cities and the coastal plantations, traditional tribal life goes on more or less undisturbed.

To oversimplify, it seems probable that this part of Africa will experience the sort of mixed development typical of third world experience during much of the twentieth century. A modern sector closely linked with the developed world (mostly with the non-Communist developed world) will flourish within the capital and its environs. A government and commercial elite, many educated and closely linked with multi-national firms, will increasingly adopt the social norms and patterns of the industrialized countries. A majority rural population will exist largely outside the cash economy and with little or no contact with the developing sector. The traditional culture will survive in a modified form. Only under conditions in which population pressures on the rural resource base make subsistence impossible will there be a chance of discontent sufficient to disrupt the modern sector. Even this possibility is diminished by ethnic, linguistic, and tribal fragmentation. The same fragmentation militates against the possibility that some leader from the developed sector will attempt a broadbased developmental program embodying a sense of identification with such culturally diffuse peoples. In any event, were such a leader to appear and threaten credibly to achieve the goal, others in the elite--probably with support from their foreign partners--would work to prevent him.[*] The necessary pre-conditions of ethno-cultural homogeneity or the ability to appeal to a past tradition, which would enable an indigenous leadership to adopt societal norms other than those of the already developed nations, do not exist.

It is possible that where some group, particularly the local military, is recruited from the non-modern sector and from one particular tribal element within it, that a superficially traditionalist movement might assume political power. This movement might then establish as national norms an official "traditional" cult, a form of national dress, and a dialect. However, it is unlikely that such a movement would be able to, or would even particularly want to, attempt to restructure the society overall. By the same token--if the experience of Kwame Nkrumah in Ghana is any indication--it is equally unlikely that such a leader could succeed in imposing new and non-traditional social forms on either the modern or traditional sectors.

With variations, this same developmental pattern could be repeated in much of Central Africa as well. Differences here are essentially those of scale. Nigeria, Zaire, The Congo Republic, and the Central African Republic are large and relatively populous states. Nigeria in particular has great petroleum and mineral resources and a relatively well-developed agricultural sector. Each of these countries has one or more modernizing enclaves. Notably, the government of all these states is military, and the chief of state more or less embodies some form of nativism combined with a policy of modernization. For example, in Nigeria, General Yakubu Gowon of the

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[*] See Richard A. Falk, "What's Wrong With Henry Kissinger," Princeton Alumni Weekly, October 1, 1974, pp. 14-18. Falk sees a developed world policy of ensuring access to raw materials by "moderating conflictual [sic] relations" in undeveloped countries. The policy accepts as "inevitable the persistence of large scale misery and repression" with support of the "favored few" to enable them to control the "disfavored many." Cited in Richard A. Fagan, "The U.S. and Chile: Roots and Branches," Foreign Affairs, January 1975, pp. 297-313.

numerically dominant Hamsa tribe (which is essentially Muslim and agricultural) gained power by successful suppression of the secession movement of the Christian and commercial Ibo.*

In Zaire (the old Belgian Congo), General Mobutu Sese Seko took control when the Lumumba faction (representing to some extent a move toward planned development Eastern European style) and the Tshombe forces (representing to an equal or greater extent willingness to establish a plantation-style relationship with multi-national firms from the western industrial nations) both foundered. Mobuto seems to represent, at least in the context of this analysis, the leader of a country with considerable resources but insufficient to support a general developmental effort and without the ethnic or cultural unity and tradition to allow a mass-based struggle for change. Thus, the exploitation and sale of resources enriches a small controlling group; more or less modern urban enclaves flourish, but at the same time there is blatant and official endorsement of indigenous ways. European names are discarded, foreign missionary efforts are discouraged, and an indigenous dialect becomes the official language. Meanwhile, life for the masses outside the modernized sector goes on relatively undisturbed.**

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*On Nigeria, see Jean Herskovitz, "Nigeria: Africa's New Power," Foreign Affairs, January 1975, pp. 314-333. The Nigerian policy is one of general development through indigenous control of resources and heavy government investment in social infrastructure while relying on free enterprise economic mechanisms.

**In early 1975, the Mobutu government adopted a policy of indigenous socialism" including nationalization of basic industries and services and the collectivization of agriculture. All religious teaching has been outlawed as part of the "Zairization" program. (Christian Science Monitor, January 7, 1975, p. 3b.) For a brilliant and pessimistic in depth social analysis of Zaire, see V.S.Naipaul, "A New King for the Congo," New York Review of Books, June 26, 1975, pp. 19-25.

These phenomena are even more marked in such marginal states as Ruwanda and Burundi where inter-tribal warfare culminating in horrifying massacres have occurred in recent years. Uganda, under General Idi Amin Dada, has portrayed a burlesque version of the process.

The potential for more fundamental change and societal development exists in such East African states as Kenya and Tanzania. Kenya, under President Jomo Kenyatta, is the only former British colony in Africa to have achieved independence through armed struggle. Such struggle, as Franz Fanon has pointed out, goes far toward providing a unifying tradition for nation-building. The Mau Mau movement which Kenyatta organized, for all its brutality, did incorporate an appeal to the traditions and culture of the dominant tribal group, the Kikuyu. Basically an agrarian people with an adequate farming technology and possessed of relatively large reserves of arable land, the Kikuyu seem to be on their way to developing a solid, peasant-based agricultural nation. Of all the African states, Kenya seems most likely to evolve a viable, tradition-based society with the potential for widespread gains in consumption standards during the remainder of the century.

Tanzania is much larger in area than Kenya. Its ethnic and linguistic makeup is more complex, especially since the incorporation of Zanzibar and its largely Arab population. Nor did Tanzania undergo the potentially unifying experience of an actual struggle for independence. Under these circumstances, it is questionable whether even as gifted a leader as Nyrere, regardless of the amount of Chinese or other guidance and support, can carry through his program of broad economic and social change. Already there have been signs of passive resistance to attempts at organizing agricultural collectives (ujamaas). The problem is even more complicated due to the variety of traditional practices which reforms must consider. Furthermore, both traditional and emerging elites are likely to oppose vigorously egalitarian programs that limit their opportunities for status and individual economic gain.*

Uganda, the smallest of the three East African Union states, and the richest in mineral resources (copper), also has the most diverse population. The diversity of its population, which is composed of over 100 tribes divided among three major ethnic groups (Bantu, Hamitic, and Nilotic) and the largest Asian population in Africa, makes the task of societal development almost impossible. It was probably inevitable that some figure like Amin, a member of the largest single tribal group, would eventually seize power. For the foreseeable future, Uganda will exhibit the familiar pattern of a small modernized sector tied to a major resource in demand by the industrially developed nations which exists at the periphery of a mixture of diverse traditional and modern cultures. No coherent societal pattern can be expected to evolve. Increased competition among disparate groups for relatively limited subsistence resources will probably result in bloody struggles, the general reduction of consumption standards, and lessened viability of the competing groups.

The Sudan, Eritrea, and Somalia share some of the characteristics of the western Sahel states. However, they are essentially Islamic and proximate to the Arab nations and, therefore, will be likely to operate as satellites of their more rapidly developing neighbors. The Sudan, in particular, has been the beneficiary of enormous amounts of agricultural development funds from the OPEC countries who apparently consider it a major food resource for the future. Consequently, it can be expected that the societal patterns adopted, at least by the controlling groups in these states, will mirror those of the Middle East generally.

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*On Tanzania's experiment with tradition-based collectivism, see Robert A. Simko, "Tanzania's Experiment in Cooperative Effort," Focus (American Geographical Society), January, 1974. For a prediction of failure, see "Tanzania's Grand Design Falters," Christian Science Monitor, December 20, 1974, p. 2.

Embodying a quite different cultural tradition but sharing most of the ethnic and resource conditions of these three states is Ethiopia. In the recent past, it appeared that a traditional native elite--the Emperor, his bureaucracy, and the feudal landholders--sought to identify itself with the west (particularly American elites) and thus to cement and continue its control.[*] However, the inability of this group to respond to the needs of the country at large, as perceived by a non-traditional elite in the modernizing military, led to its overthrow in the coup d'etat of 1974. (It is significant evidence of the elite's western ties that the former prime minister executed after the coup was the world president of the YMCA).

Given the current level of development in Ethiopia, the new leadership's options are limited. It is not surprising that they have moved toward the form of military controlled, peasant socialism that has become a worldwide phenomenon in recent years. Ethiopia, in this respect, seems rather like Burma. It has maintained its unique religion and societal tradition and has existed historically in isolation from the rest of the world. Its ethnic fragmentation and the inability of the dominant racial group to control the secessionist movement in Eritrea further underscores its resemblance to Burma. And like Burma, it is of only marginal interest to any of the great powers.

Angola and Mozambique are the biggest African questionmarks. Just now achieving independence after years of desultory armed struggle, these territories are rich in natural resources. They have relatively well-developed infrastructures (now apparently in the process of disintegration) and strong links to Europe.

The leadership of the guerilla forces that impelled the grant of independence is strongly influenced by Chinese-style communism. (In turn, this leadership seems to have influenced the leaders of the military revolutionary

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[*] Constance Holden, "Ethiopia: Did Aid Speed an Inevitable Upheaval?". Science, December 27, 1974, pp. 1192 ff.

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government in Portugal.) If this leadership is able to assert control, it is probable that an attempt to develop along the austere collectivist lines of Algeria or Tanzania will determine societal trends. If, on the other hand, the still powerful Portuguese and *assimilado* elites--possibly with the assistance of Brazil--should gain control, the pattern typical of West Africa (modernized elites in the cities and at the commercial plantations and mines with a large and relatively ignored traditional population elsewhere) would be the likely result. The third possibility is a repetition of the Zairian experience: a nativist government endorsing traditional ways and limiting the influence and growth of any elite aspiring to European norms and, at the same time, repressing any left-oriented collectivist tendency.

Throughout Africa for the remainder of the century, one societal pattern is consistent. Whatever forms evolve, the life of the mass of people remain at the subsistence level under primitive rural conditions.

Developing Nations--India, Pakistan, Bangladesh

The Indian sub-continent is perhaps the easiest region of the world for which to predicate a societal trend. With the exception of West Pakistan (today known merely as Pakistan), the prediction would have to be the playing out of the Malthusian drama with concurrent societal breakdown and lapse into anarchy. In India, and even more so in the new state of Bangladesh, the essential population-resource ratio has been exceeded. Existing social patterns and behaviors--in particular, the traditional large rural family as a survival requirement--translate into overall social disaster. The prognosis is for widespread starvation and population decline by the end of the century. Out of the disaster, some new forms of society will develop. It is likely that these will be distinct and localized in the more ethnically and culturally homogeneous nations that will arise to take the place of fragmented India as it now exists.[*]

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[*] Alexander Chichenov, "The Tendencies in the Development of National Relations in Independent India," *Asian Survey*, March, 1974, provides a Soviet scholar's view.

Pakistan is the probable exception. No longer dragged down by the dead weight of East Pakistan (Bangladesh), Pakistan will increasingly be oriented toward the Middle Eastern Muslim world. In some form or other, Pakistan will become associated with Iran and develop societal patterns more or less along the model of those that will emerge in her richer neighbor.[*]

Developing Nations--Southeast Asia

At the present time the countries of Southeast Asia still enjoy relatively favorable population-resource ratios. Some of them--Thailand, Cambodia, Laos, and Vietnam, particularly--enjoy a high degree of ethnic and linguistic unity. In the first three of these, to which may be added ethnically divided Burma, near universal adherence to Buddhism provides a unifying cultural base.

All these countries--excluding Cambodia--have the potential, on the basis of their own resources, to evolve toward a more industrially developed state and to adapt their existing institutions to accommodate resulting changes. Or, they could maintain or revert to a more traditional and still viable way of life within the context of existing societal forms. To a large extent, the possibility of doing either depends on the ability to control population growth. Within a few decades, if present growth rates continue (especially in the case of Thailand), the possibility of maintaining the existing traditional system will disappear, and the alternative possibility of evolutionary, non-traumatic change will become both more difficult and more necessary.[**]

Of the countries mentioned, Thailand is the one most likely to develop along the familiar lines of a super-modernized metropolis with a controlling elite closely tied to foreign sponsors through the agency of multinational firms. This process is far advanced. However, the relationship is relatively fragile, since the major bond between the Thai leadership and the western countries has been political and ideological, rather than economic. Unless major oil reserves are found in Thai territorial waters, there seems little reason for the United States to maintain the present elite as American strategic interest in the region declines.

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[*] Qutubuddin Azia, "Muslim Neighbor Pakistan is Sharing Arab Oil Wealth," Christian Science Monitor, February 6, 1975, p. 3a.

[**] Note: The following paragraphs on Southeast Asia were written in December, 1974. Obviously, the immediate situation has changed drastically. However, there has been no attempt to reassess the situation in the light of these changes, since over the long term the analysis appears to hold.

Burma, unlike Thailand, is ethnically fragmented, and the central government has been plagued by insurrections among secessionist-minded minorities. However, the majority of the Burmese population has tended to revert to a pre-British rule, traditional mode of isolated life which, at the present time, is misnamed socialism. Lack of strong ties to the outside world, and suppression of any potentially modernizing elite, make it probable that--through the remainder of this century--the Burmese will continue to maintain a viable traditional Buddhist society without any conspicuous trend toward industrial, technological development based on either Western or Eastern models.

Cambodia faces a long period of continued disruption of the existing societal framework due to war. The most likely among several possibilities is that after a more or less lengthy period of destruction, the forces opposing the existing government will prevail and impose a North Vietnamese style of social organization. Fortunately for the people of Cambodia, the ratio of people to agricultural resources is so favorable that regardless of the level of efficiency achieved during the transition period, the population is unlikely to suffer very greatly. Since Asian Communism has generally built on the existing cooperative tradition, societal change has not been as abrupt for most individuals as many observers have imagined. If, however, the change involves abandonment of Buddhism--the central cultural support of society--then considerable difficulty can be expected. Regardless of this fact, Cambodia can be expected to meld into the world of rural Asian Communism. Thus the possibility of the modern enclave-rural traditional hinterland split type of development is precluded.

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Vietnam remains an enigma. Over the long term it seems most probable that the two halves of the country will be united under a Communist leadership. The by now familiar type of societal organization adapted from the Chinese model of controlled development on a collectivized rural peasant base will then appear. Assuming that population growth will be controlled, Vietnam has sufficient land and water resources to support a viable society without much reliance on the outside world. The "modern sector"--the swollen urban complex characterized by severely maldistributed wealth--will tend to disappear as the Asian variant of the collectivist, controlled consumption, egalitarian society develops.

Unfortunately, as is the case in Cambodia, the sheer amount of physical disruption brought about by the continuing war has had, and will continue to have, devastating effects on the traditional societal institutions. The erosion and exhaustion of these institutions make doubtful any real possibility of their adaptation into new and viable forms. On the other hand, as in China after 1949, the collapse of traditional institutions does allow for the rapid introduction into the societal vacuum of new forms which, in China, at least in the material sense, have shown themselves adequate.

Very important for any consideration of societal trends on the mainland of Southeast Asia--aside from recognition of the relatively favorable population-agricultural resource ratio--is the strength of the Buddhist tradition. While, on the other hand, this strong religious tradition would seem to present an obstacle to the creation of communist states--and to some extent it does--it also is conducive to a life-style of communalism and controlled consumption. So-called "Buddhist economics" defines the social objective as maximum wellbeing with minimum consumption. In consequence, Buddhism probably predisposes the peoples of Southeast Asia toward the adoption of collectivist as opposed to individualist societal patterns and forms.

The ethnic Malay countries of Southeast Asia--Malaysia, Indonesia, and the Philippines--are in a very different category than the Buddhist countries.

They suffer from a far less favorable population-agricultural resource ratio. Additionally, they both enjoy (and suffer from)--particularly in the case of the former two--the possession of industrially essential raw materials. Rubber, tin, other minerals, and petroleum support a wealthy, modernized enclave existing in close relationship with the industrial West and Japan. However, the rapidly growing populations of these states are already so large compared to the amounts of available resources so as to preclude the choice--open, for instance, to the Arab states--of implementing broadbased, general programs of industrial development and modernization. For Malaysia and particularly for Indonesia, the future seems to indicate a continuation of the present trend. A modern sector providing raw materials to the industrialized nations will grow and expand alongside the existence of an impoverished, marginally viable traditional sector and a large, rootless, poor urban sector recruited from the surplus rural population.

Of the three countries, Indonesia (overlooking Hindu Bali) is culturally the least fragmented. The vast majority of the population is ethnically Malay, Malay-speaking, and Moslem. The present government came to power by overthrowing the Sukarno regime which had attempted, albeit clumsily, major socio-economic innovation in the direction of socialism. It was able, in doing so, to enlist powerful traditional forces and direct them not only against an unfamiliar ideology but against the major ethnic and cultural minority--the Chinese. Since then, the regime has been able to distribute the benefits accruing from its plantation style relationship with Japan and the Western industrial nations widely enough to gain the support of and keep control over the traditional and emerging economic and political elites.

Malaysia--less well endowed with resources than Indonesia, but nevertheless wealthy in its own right--is ethnically and culturally split. Although control of the government and of social policy is in the hands of a Malay, Muslim ruling group, the population is (in West Malaysia) almost equally divided between Malays and ethnic Chinese, with Indians composing a significant ten percent as well.

The struggle between the economically more active Chinese* and the politically privileged Malays is the outstanding political fact of Malaysian life. To date, the traditional Malay elite has been able to manipulate anti-Chinese feeling to maintain control. Part of the price paid for this control is acquiescence to rural, often anti-modern, Moslem feeling.

Thus split, Malaysia demonstrates a diversity of societal form, although there is official pressure for adherence to Malayan and Islamic norms. The general tendency, though, is for the develop of co-existing modern and traditional sectors. These sectors are not yet as sharply differentiated as they may become (due to inheritance from the British of well-developed governmental institutions and programs). Since the Malay population on which the controlling political elite depends is largely rural, there is an additional tendency to pay more attention to the non-modern sector than is common in countries with dual sector development.

The Philippines have for a long time demonstrated the fullest flowering of the plantation society. Nowwhere in Asia has there been such a maldistribution of wealth, such contrast between opulence and poverty. The situation has persisted through Spanish, United States, and indigenous rule.

Despite its very high population growth rate, the population-agricultural resource ratio is not yet desperate. Even under the present landholding system of great latifundia in the most fertile regions of Luzon, there is still much unused land on the other major islands of the archipelago that allows hope for peasant resettlement and development schemes. However, although the Philippines have produced recent leaders, such as Magsaysay and

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* The Chinese in Southeast Asia are frequently and mistakenly described as economically dominant. The economies of Indonesia and Malaysia are essentially controlled by European, Japanese, and North American interests. While some Chinese are, of course, enormously wealthy--usually through trade and commerce--the vast majority of Chinese are poor shopkeepers, petty traders, craftsmen, urban wage workers and plantation labor.

Marcos who have devoted considerable effort to rural development projects, the results have been socially negligible.

In part, this is due to lack of public resources, but more directly it reflects the severe economic class split between upper and lower class Filipinos. This is severe in Luzon where there is both cultural and ethnic identity (Roman Catholic and Malay), but was worse in Mindanao and Sulu where fierce resistance has resulted from the attempt of Catholic government officials to resettle Catholic peasants from crowded Luzon amid a Moslem population.

Given the decreasingly favorable population-resource ratio, the lack of other than ethnic identity among the population, and the inadequacy of natural resources to support simultaneously the privileges of an existing and reactionary elite and a program of general development, the prognosis for the Philippines is continuation of the present system for the near term. Existing societal forms will probably endure in a decreasingly viable form for the remainder of the century, with potential for collapse and the emergence of some new societal patterns.

Developing Nations--Latin America

Latin America is far more of a geographical expression than a political, economic, or social reality. It has a unity stemming from use of the Iberian languages and the Catholic cultural tradition of most of its countries. However, the Caribbean, Central America, Mexico, Brazil, Argentina, and the Andean countries are a diverse group in terms of resources, ethnicity, stages of economic and social development, and ideologies. Thus, societal trends throughout the region are, and will continue to be, bewildering in their variety.

For the Caribbean region (excluding Cuba), the forecast is bleak. On the major islands, population growth long ago exceeded agricultural resources.

Hunger and apathy are the result on both ends of Hispaniola. Both Haiti and Santo Domingo are now experiencing conditions duplicated only on the Indian subcontinent and in the Sahel. Puerto Rico has only been able to postpone facing its situation through mass emigration to the United States.

Given the solid control of elites who have little or no essential identity with the masses of rural and urban poor, and the impossibility of raising living standards through development on the existing resource base--agricultural or other--it is difficult to foresee any societal trend other than a continuation on a debased level of present societal forms. This means maintenance of a small upper and middle class through the proceeds of export of such resources as do exist (sugar, beef, coffee, tobacco, and other tropical produce, and some minerals, particularly bauxite) to the United States and Europe. The dominant groups will emulate, insofar as their income permits, the societal forms of the United States and Western Europe. They will seek, partly through such emulation, to demonstrate their distance from their impoverished masses as a means of qualifying for support by their industrial nation patrons against any attempts at change that threaten their control and/or standards of consumption.

The mini-states of the Caribbean (primarily the old British West Indies), of which Jamaica and the Bahamas are chief, show equally unfortunate tendencies. Population pressures and lack of resources in sufficient quantity to support a general level of development mean that local elites, despite ethnic (black) and cultural identity with the mass of the population, will seek by any means to monopolize the few resources that exist. For most of the island states, this means cashing in on their sunshine and beaches to promote tourism with foreign capital. For others, it means establishing--along with the luxury hotels and casinos--tax havens for the wealthy of the developed world who are able to escape from countries where the need for social investment over the next generation imposes burdens they would rather not share.[*]

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[*] Jamaica, with its bauxite, is a partial exception. See Andrew St. George, "The Amazing New Country Caper," *Esquire*, February, 1975, pp. 60 ff.

The populations involved are small in absolute numbers. It is very possible that a combination of emigration and family planning programs could reduce and stabilize their numbers at a level that would allow them to share significantly in the resort industry prosperity. Societal patterns then would not differ greatly from those in evidence at the tourist centers of the industrialized world. If, however, the population problem is not resolved in this way, then the prognosis is for the sort of dual development typical of other resource poor, undeveloped areas. This would be expressed in the spread of such deracinated cult groups as the rastifarians in Jamaica, and similar movements which have recently emerged in the Virgin Islands, Dominica, and elsewhere.

Central America is a region in which the population-resource ratio is already severely out of balance. As the Paddocks point out in their critique of foreign agricultural development assistance, these countries are poor precisely because their soils and water resources are poor. Traditional societal forms have stimulated their very rapid population growth which exacerbates further the problem. The controlling elites are ethnically and culturally distinct from the Indian, mestizo, and black masses, and thus show little commitment to any change which would entail self-sacrifice. The elite tend to identify with the North American and European customers for their coffee, bananas, and other tropical products.

The future for Central America--Guatamala, Honduras, El Salvador, Costa Rica, Nicaragua, and Panama--appears bleak. Few resources, a backward traditional mass society, elites committed to resisting change, all indicate societal stagnation in the face of worsening material conditions. The result will be the familiar pattern of a small, high consumption elite stationed in modernized enclaves of capital cities and embracing the social forms and norms of corresponding groups in the developed nations. In the non-modern countryside, the traditional societal forms will prove decreasingly viable, but will continue in a debased form. The surplus rural population will continue to drift into the cities, forming a growing lumpen-proletariat in which societal breakdown is marked by the incidence of crime, prostitution, alcoholism and drug addiction, illegitimacy, and pauperization.

Mexico differs from the Central American countries in its great size, its possession of considerable resources, and, above all, in its history. At the same time, it resembles them in its culture, its ethnic makeup, and in its high rate of population growth.

Mexico has been something of a success story among lesser developed nations over the past two decades. It has relied on "trade not aid" for the development of a major industrial sector. Mexican agronomists working with the Rockefeller Foundation played a significant role in the development of the so-called miracle wheat. Agriculture has been rationalized and made more productive in the context of a land reform program now more than fifty years old. A strong, progressive government has maintained both internal order and national independence in foreign affairs, while preserving considerable liberty of press, speech, and political expression. Most essential natural resources are nationalized, and law and policy inhibit, if they do not entirely prevent, the growth of foreign influence in Mexican industry and trade. A strong and increasingly affluent middle class has grown up.

Yet, the situation grows increasingly desperate for great numbers of Mexicans. Unemployment and underemployment probably exceed 20 percent of the labor force. The only effective safety valve operating is migration, legal and illegal, to the United States. As the demand for low wage labor that allowed the United States to tolerate or even encourage Mexican immigration at high levels disappears, this safety valve will soon be tied off. Alternatives, such as the opening to settlement of agriculturally marginal lands in Yucatan, seem few and inadequate.

The ethno-cultural aspect is somewhat clouded in Mexico. There is an official commitment to a Mexican national identity in the country's political ideology and rhetoric. The Aztec glories of the past are preserved and celebrated through a heavily funded government program. The tradition of Indian communalism is evidenced in support for the *ejidos* in the land reform program. For the majority *mestizo* population, there is the quasi-religious cult of *la raza*, symbolized by the Virgin of Guadelupe.

Yet, there has been a persistent historical tendency of Mexico's rulers to consider Mexican culture (and even the racially mixed Mexican) somehow inferior. The Indian President Juarez based his program on the destruction of Indian communal land holdings as a prerequisite to progress. His successor, Porfirio Diaz (also an Indian), accepted completely during the last decades of his rule the notion of Mexican and Indian racial inferiority and made huge concessions to Europeans and North Americans to encourage investment and immigration. The Revolution of 1910-1917 brought a great resurgence of nationalism and ethnic pride that received renewed impetus under another Indian President, Lazaro Cardenas, when he defied the United States and successfully nationalized the foreign-owned oil industry in 1938. However, since that time, and especially among the growing middle and upper class of Mexican industrial society, there has reappeared the anti-nativist tendency in a variety of forms.

In view of these considerations, it would seem that the most probable societal trend for Mexico during the remainder of this century is the continued division of the country into modern and primitive, affluent and impoverished sectors. Both sectors will be rooted in viable but competing Mexican traditions. The modern sector, identifying with the Spanish conquest and the tradition of colonial culture, will continue adapting its peculiar social forms and patterns to accord with the industrial-urban system. Features will include high levels of ostentatious consumption, formal religion, traditional multi-generational family organization under male domination, and commitment to a hierarchical, authoritarian, role-ascriptive social organization.

The traditional Indian societal forms--also adapted to meet changing rural conditions--can remain viable in Mexico for large numbers of people, provided population growth rates can be controlled. Indian communities will remain impoverished, yet traditional religious and social forms will provide many non-material satisfactions. Conducive to the maintenance of traditional societal patterns of Mexico's Indians is the government commitment to the Indian past and appreciation of the vitality of Indian art and folkways. However, uncontrolled population growth will inevitably undermine and debase further this culture and produce a demoralized and deracinated indigenous proletariat.

The great mass of Mexicans, rural and urban, who are neither Indian nor part of the modern sector, have developed a distinctive societal system and culture that draws on both Indian and Spanish sources. However, they are alien from both and depreciated by the modernized upper classes. As Oscar Lewis showed in his studies of Mexican urban and rural dwellers (*Children of Sanchez* and *Pedro Martinez*), their social forms can quickly deteriorate under adverse material conditions into the universal culture of poverty.

Whether Mexico--the *Many Mexicos* of Leslie Byrd Simpson's classic analysis--can develop unifying societal patterns over the next twenty-five years depends greatly on whether the present excessive population pressure on resources can be eased. In Mexico's favor is the relative abundance of resources. Within the last year, very large oil strikes in Yucatan and finds of major phosphate deposits in Baja, California have been reported. Also favorable is the strong nationalist political ideology. However, the possibility is great that the controlling elite will tend to monopolize these resources to support their high consumption, individualist materialist life style based on North American patterns, while the traditional Mexican and Indian societal forms become debased and non-viable.

Venezuela represents a variant on the Mexican situation. Here, there is no strong aboriginal ethnic community to complicate the societal pattern, however. There exists only the more usual confrontation of a controlling upper class elite, more and more attuned to the prevailing forms of their

European and North American analogues and a mass population still clinging to a traditional but threatened Latin life style.

Like Mexico, Venezuela is blessed with abundant petroleum and other mineral resources, but is faced with a burgeoning population. Venezuela, like Mexico, also has an intensely nationalist economic policy designed to maintain control of its resources. This reflects a similar political philosophy and official developmental strategy designed to distribute equitably the wealth produced from exploitation of mineral resources and to produce the savings necessary to support both agricultural and industrial development. Under various regimes and using different slogans, these policies have been more or less strongly supported for the past thirty years. Yet the persistent trend toward rural pauperization, concentration of wealth, urbanization, and division into modernized and non-modernized sectors continues.*

Venezuela's population, relatively small in comparison to its resources (despite one of the highest population growth rates in the world), provides hope that the process of division can be stopped. The possibility that Venezuela can evolve new societal patterns adapted to a generalized and equitable development over the next twenty-five years is good.

Colombia shares many of the characteristics of Venezuela. However, its population is much larger and its share of resources is much smaller. Furthermore, the very deep and largely irrational hostilities within Colombian society--expressed in the so-called violencia of 1948 to 1968 that resulted in hundreds of thousands of deaths--still simmer beneath the surface. The upper and middle classes of Colombia are closely tied to the economies and life styles of the developed countries. The prospect is one of continuing division of the society into a high consumption modernized sector embracing European or North American societal forms and an increasingly less viable traditional sector. This is likely because those in the modernizing sector--who constitute the controlling group--will probably make the easy identification of their class interests with the national interest. Formal political parties in Colombia have established a power sharing arrangement which makes it unlikely that any adversary, issue seeking, parliamentary or democratic process will threaten their control. The existence of the aforementioned antagonisms among the masses and the presence of the effective, American-assisted, police and military forces developed to pacify them, make it equally unlikely that any mass movement threatening the controlling group will effect change.*

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* Joseph Mann, "So Far Venezuela's Wealth Means Little to the Poor," New York Times, May 11, 1975, p. E2.

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Ecuador, Peru, and Bolivia, countries which with Venezuela and Colombia are associated in the Andean Common Market (ANCOM), have in common large mineral and raw material resources; they are (excluding Bolivia) major purveyors of tropical produce, including coffee, bananas, sugar, and cotton. However, they are distinct in their ethnic division (due to large, traditional Indian populations) and in their attitudes toward social and economic development.

Landlocked and isolated Bolivia is probably the least modernized of mainland South American countries. Its importance to the developed world stems from its possession of great tin mines. Over the last thirty years or so, intense struggle among the modernized sector--which includes the tin miners themselves--for control of this resource and the distribution of earnings from it, has been the salient fact of Bolivian history. At the present time, a small upper class, in partnership with a dominant military faction, is in control. These groups, to the extent they are able, strive to achieve a high consumption standard.

The majority Indian population of the country maintains a low subsistence traditional agricultural society in the highlands. In Santa Cruz

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* John W. Sloan, "Colombia's New Development Plan: An Example of Post-ECLA Thinking," *Inter-American Economic Affairs*, Autumn, 1973, pp. 49 ff.

province, a lowland area east of the Andes, a considerable area has been opened to subsistence agriculture over the past twenty years. Bolivia's population is small and relatively slow growing. There is little reason why the present division into a small, crudely modernized sector exploiting the tin and other mineral resources of Bolivia will not co-exist with a relatively viable traditional subsistence agricultural sector. Co-exist is perhaps not the right word. It is more accurate to say that the two societies will continue within the same boundaries, having little or no contact and less knowledge of each other.

Peru, by far the largest in area and population of these three, is similar to, but far more highly developed than, Bolivia. The traditional situation in Peru was one of a Europeanized controlling group, ethnically and culturally distinct from the Indian or *Cholo* (*mestizo*), dominating all sectors of the economy in collaboration with representatives of firms from Europe and North America, whose life style they emulated and increasingly shared. The Indian communities of the *altiplano* maintained a decreasingly viable traditional societal pattern. The glorious Incan past was part of the national pride and mythology, but the Indian of the present was despised and exploited.

The only serious modern political movement that opposed the elite was the APRA of Raul Haya de la Torre. *Aprismo*, rather complex and muddled as a political philosophy, made a strong appeal to an older middle class of businessmen and small landholders who were increasingly crowded out by the new elite. Unfortunately, the strong antipathy which developed between the military and Haya de la Torre ensured the suppression of this APRA's efforts to take power by electoral means. In the 1960s, a strong Christian Democratic movement gained control and attempted some reforms.

However, the pace of reform was too slow for leftist elements within the armed forces, many of them from lower middle class and Indian backgrounds. Resentful of the foreign control of the Peruvian economy exercised through the

Lima elite and convinced that continuation of the existing trend would eventually lead to mass revolution, they seized control and embarked on an ambitious restructuring of society.

In essence, the new Peruvian leadership, working from an adaptation of Yugoslavian models, is attempting to develop an egaliatarian, mass participation, controlled consumption society. For the time being, at least, the power of the old elite which was allied with and emulated the individualist, high consumption societal patterns of North America and Western Europe, has been neutralized. The possibility is great that the present trend in Peru will continue over the next twenty-five years. The natural resource base/population ratio is relatively good. The ethnic division in the country is partially compensated for by the existence of a strong, albeit mythic, historical tradition of past greatness in the Inca Empire.

If the existing government retains its sense of commitment, if the rate of population growth can be controlled, and if the rate of urbanization can be limited, Peru stands a good chance of creating societal forms suitable to its situation. Such forms will incorporate the nuclear family mode without experimentation with alternatives. At the same time, the collective entity--the nation, the community, the cooperatively managed enterprise, the agricultural collective--will have first claim on energies and loyalties. The Peruvian societal experiment can be viewed as a compromise between Latin individualism and Indian communalism influenced by Eastern European forms of organization. For the moment, the latter influence appears to control.*

Chile, where an attempt to organize an East European type of community and society was defeated by a combination of internal resistance and external pressures, demonstrates the continuing strength of the high consumption,

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* "Ideological Direction of Peruvian Regime Emerging," Los Angeles Times, February 15, 1973, Part I, p. 32. For a scholarly analysis, see Donald W. Pearson, "The Comunidad Industrial: Peru's Experiment in Worker Management," Inter-American Economic Affairs, Summer 1973, pp. 15-29.

individualist elite sector allied with comparable groups elsewhere through the agency of the multinational corporations.[*] For the immediate future, the probability is that Chile will continue the pattern of dominance by a relatively affluent elite embracing the societal patterns of North America with the pauperization and societal breakdown of those outside the top sector.

This pattern is traditional in Chile where the rural laboring masses (the surplus of which increasingly has crowded into the *callampas*--slums--of Santiago) are known as *rotos* (broken ones). Partly because of openness and intellectual freedom in Chile, the signs of societal breakdown have long been visible and discussed. The incidence of alcoholism, illegitimacy, consensual union, abortion, and even physical deterioration among the general population is well known, but has been generally ignored or tolerated by the controlling groups.[**] These, with their high percentage of persons of non-Latin European origin, tend not to identify with the *mestizo* mass of the population. Since those among the elite who pursued a reformist policy are now being ruthlessly destroyed or cowed by the existing government, it is improbable (barring some unlikely upheaval) that the situation will change in the next ten to twenty-five years.

Argentina and Uruguay are anomalies in Latin America. Both have very favorable resource-population ratios; both have essentially homogeneous populations, ethnically and culturally. Despite disruptive political turmoil over the past decades, both maintain relatively high levels of material consumption at all levels of their societies. Population growth rates are already very low; furthermore, the state of education and medical development supports the presumption that overpopulation will not become a problem in these essentially Europeanized states. The traditional Italianate conservative societal patterns will continue to endure, most probably, during the remainder of the century despite the probable continuing political violence.

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[*] Fagan, "Chile and the United States," *Foreign Affairs*, January, 1975.

[**] Chile's infant mortality rate (*UN Demographic Yearbook 1967*) of 108.5 is among the highest in the world. Almost one third of Chilean pregnancies are terminated by abortion. About 40% of hospital admissions in Santiago are for bungled abortions. (Ehrlich, *Population, Resources, Environment*, p. 224.)

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By far the most dynamic nation in Latin America--perhaps in the Western Hemisphere--is Brazil. Vast territory and great natural resources in both land and minerals, offset the effect of a huge and rapidly growing population, now in excess of 100 million people. Nevertheless, in some regions, particularly the Northeast, population has for many years pressed overly hard on the resource base so that famine--especially during cyclically recurring periods of drought--has been a factor during this century.

Just as China was cited as an anomaly in the context of this analysis, so may Brazil be. Possibly no other major country in the world is as fragmented--ethnically, culturally, and regionally--as Brazil. A traditional ruling class, often threatened in the recent past by actual or imagined social revolutions, monopolizes the wealth of the country. To avert the latest such threat ten years ago, the elite supported a military coup and the subsequent establishment of a military dictatorship that has distinguished itself for brutality and ruthlessness in suppressing dissent (even by the politically active among the elite). On the other hand, the same dictatorship has presided over a massive and relatively successful program of economic modernization.*

Under these circumstances, one might expect that the familiar pattern of dual development--the controlling elite in a modern sector and an excluded and ignored traditional or non-developed sector with consequent imbalanced societal evolution--would be the result. However, despite the continuing inequity of distribution of wealth and the telltale burgeoning of slums (*favelas*) around the major cities, Brazil appears to be in the process of creating a whole variety of viable societal forms.

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* Edwin McDowell, "Cautious Progress in Brazil," Wall Street Journal, May 29, 1975, p. 12, provides a brief and sober journalistic summary of recent Brazilian experience.

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In general, these forms are adapted to levels of high and conspicuous consumption of industrial age goods. Since there is a strong probability that over the short term, at least, the resources of the country will permit increasing high consumption, tolerance for these forms is great. Furthermore, the culture of Brazil is so highly fragmented and diverse, even among the controlling groups, that tolerance for a wide variety of societal forms--pluralist and individualist--is greater than in almost any country save, perhaps, the United States. This tolerance extends to acceptance of great disparities in wealth and income and to an apparent disregard for assaults on the natural environment. At the same time, the underlying confidence in the Brazilian future that permits such tolerance enables controlling groups to regard themselves as secure.

The prospect for Brazil, then, is one of general but uneven development along industrial-technological lines with the concurrent evolution of a wide variety of societal forms, all more or less adapted to the highest levels of individual consumption and display that the national resources permit. The military government, unlike that in Peru and elsewhere, shows a high degree of commitment to such values and, conversely, great hostility to controlled consumption and egalitarian norms. Hence, the probability is that until and unless population pressure on resources (nationally and not merely regionally) becomes severe, Brazil will continue this trend throughout the remainder of the century.

TREND PROJECTION FOR INTERNATIONAL CONFLICT - 1975-2000*

The post-World War II history of the developed countries has been characterized by exponential economic growth and a steady and unprecedented increase in standards of consumption among their populations. This has enabled the leaders of these countries to ignore or discount the analyses of those critics who have tried to call attention to basic flaws in their assumptions, their policies, their methods, and their systems. Events of the past few years--such as the collapse of the Bretton Woods international monetary system; double-digit inflation in the industrial economies; the energy (petroleum) shortage; the less than complete success of economic development theory in the Third World; the exposure of the extent of environmental degradation; the stalling of the "Green Revolution"; and the spread of nuclear weapons technology--have severely shaken the confidence of traditional leaders.

The mass of the public is understandably confused but is inclined, as usual, to trust, if grudgingly, the existing conventional leadership. There is currently no indication that the public in developed countries demands radical or even significantly reformist measures. Unless their domestic situation worsens considerably--specifically, unless there is depression scale unemployment--there is little indication that a revolutionary situation will develop.

The relative domestic tranquillity of the developed countries in the face of a deteriorating economic situation is probably one of the most significant factors that will affect the possibility of major international conflict during the rest of this decade. This projection contradicts Crane Brinton's widely-adopted thesis that revolutions arise from situations in which a period of improvement in living conditions comes to a halt; that revolution results from the thwarting of rising expectations rather than rebellion provoked by misery. Whatever the general validity of this theory may be, it is based on study of the

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*Prepared by David MacMichael

French Revolution when the physical misery from which significant numbers of the population were proceeding to free themselves was so intense that the fear of having to return to it probably was sufficient goad to rebellion.

In contrast, the conditions of life for the majority of people in the developed countries today are so far above the subsistence level, indeed are so far above the level that most older adults knew in their childhood and youth, that there is a fairly widespread sense that consumption standards could be reduced somewhat without fear of actual suffering. There is even some evidence that many people actually feel oppressed by their abundance and would welcome a simpler, less materialistic life style. If lowered standards of consumption are accompanied by a token redistribution of wealth and/or equity in sacrifice and, most importantly, if full employment or near full employment is maintained, then the only revolution to be expected is a revolution of decreasing expectations.

The situation is far different in the undeveloped countries, especially those (prototypically the sub-Saharan nations, India, Pakistan, Bangladesh, and the Carribbean lands) which have few, if any, essential raw materials to offer to the industrial countries. Here the failure or partial failure of the existing world system will inevitably produce Brinton's projected effect. Where rising expectations did not extend to dreams of living like an American corporation executive, but only to the possibility of living like an American corporation worker; where fears were not of having to eat hamburger after having acquired a taste for sirloin, but were nightmares of starvation; desperation will produce decades of violent struggle for control of the inadequate subsistence resources.

In the Indian subcontinent, Africa, and in much of Latin America, the prospect of repeated and violent power struggles--revolutions and counter-revolutions--is very great. The recent events in Chile (despite possible outside stimulus) can serve as portent, as can the coup d'état in Ethiopia. There is very little reason to think, though, that the much talked of assaults of have-not countries on the haves will occur. Those poor countries that are fortunate enough to possess raw materials essential to the economies of the industrial countries will doubtless come under the control of groups that will, as opportunity presents itself, employ "blackmail"--e.g., nationalize or threaten to nationalize foreign firm holdings of those resources--in order to get more favorable prices. The developed countries will, in general, acquiesce, relying on their ability to co-opt or corrupt the controlling groups, offering in turn to protect them against ouster.

Indeed it is far more likely that where circumstances permit and where less direct methods fail, the developed countries will employ military force to ensure access to raw materials than that the undeveloped countries can or will plunder them. Certainly, the not-so-veiled threats made by United States leaders against non-cooperative Arab states in recent months would support that conclusion. Such action would be undertaken only when the aggressor nation ascertained that action would not provoke counteraction by another developed nation. Overt use of military force by a developed country--particularly in sensitive areas like the Middle East--is not probable.

In summary, the next two decades will be ones of comparative international peace. Wars between have-not states for control of regional resources (e.g., an Indian-Pakistani struggle for Kashmir) will not draw in the major powers; such wars will be essentially extensions of the civil strife that will, as noted, continue within those states.

Two possible major exceptions would be motivated by essentially non-economic, emotional and ideological concerns. First, in the Middle East the Arab powers will probably attempt to eliminate or reduce Israel's power with the chance that the United States--against its own longterm economic interests--will risk war with the Soviet Union, which itself has no economic need for the region's oil.* The second

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*See: Theodore Shebad, "Soviet Welcomes the Increase in Oil Prices," New York Times, October 13, 1974, p.2. Soviet oil production is 450 million tons (3 billion, 150 million barrels) annually. Currently, the USSR imports 14.7 million tons (chiefly from Iraq) of oil, while exporting (chiefly to Eastern Europe) 118.3 million tons.

and less likely possibility would pit the Soviet Union against China on the borders of Sinkiang. Should either of these situations result in actual war, the chance of nuclear weapons use is very high. Even should such use be confined to the territories of the major combatants, the environmental effects (leaving aside the sheer population slaughter) would be both global and incalculable.

The most reasonable trend to expect in the instance of Middle Eastern power struggle is a continuation of that which became manifest during the Yom Kippur War. The United States, if it chooses to back Israel strongly, will find itself alone. The other Western European countries and Japan which are dependent on Arab oil, will support and (as in 1973) will restrain the United States from use of bases in Europe to support supply or other intervention measures. The change of government in Portugal makes it most improbable that the Azores bases would be available again. Thus, the United States' ability to act effectively alone, even if it accepted the risks of (1) war with the Soviet Union or (2) a renewed Arab oil embargo, would be much reduced.

There would doubtless be a great amount of rhetoric, diplomatic activity, and genuine anguish were the survival of Israel placed in serious jeopardy. However, so long as the result of an Israeli defeat would not place actual control of Mideast oil in the hands of the Soviet Union, the United States would probably accept the outcome. Indeed, if an Israeli victory (with or without significant U.S. support) or an Arab defeat (with or without significant Russian support) threatened a result that did place political control of the oil reserves in the hands of the Soviet Union (an oil surplus nation itself with no economic need for Arab fuels), it is difficult to believe that the European nations and very probably the United States would not move to restrain the Israeli or to preserve the Arabs.

The discussion thus far helps to illuminate a very important trend break from the not so recent past in international relations. The economic rationale for post-war American foreign policy was based on the conviction that the United States needed foreign markets to prevent the collapse of its economy.* This was traditional foreign policy thinking in Europe, where the assumed needs for markets had dominated British and, later, continental thinking since the late eighteenth century. While the industrial nations' desire for foreign markets still exists, it is now secondary to insuring access to the raw materials needed to maintain production for domestic consumption. As a matter of fact, in the face of the spectre of raw materials shortages, ability to serve domestic markets re-emerges as a requirement taking precedence over selling abroad. Where once one's foreign *customers* were of most concern--at least of most *expressed* concern--today one's foreign *suppliers* have become the objects of primary attention. The logic of this perspective is reinforced by the simple fact that the vast bulk of the foreign sales (even of their own raw materials) of the developed nations is among themselves.

The argument has been raised, most notably since India's explosion of a nuclear device, that those impoverished lands lacking raw materials desired by the industrialized countries will, in their desperation, manufacture crude atomic weapons and by threatening their use force the rich countries to redistribute wealth to them. There is little realistic historical or strategic analysis in support of such speculation. However, this assumes a level of leadership accountability to the mass of the people which is not found in most developing countries. Indeed, a feature of economic development in the non-industrial countries during

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*See, e.g., Walter LaFeber, *America, Russia, and the Cold War* (John Wiley and Sons), pp. 44-53.

the past decades, as the work of Adelman and Morris* has made clear, has been the extent to which such gains as have been made have been concentrated in relatively few hands with the impoverished masses worse off, on an absolute scale, than they were twenty and twenty-five years ago. That the leaders of these countries would be so concerned for the plight of the majority of their countrymen that they would attempt armed robbery on their behalf seems much less than likely.

This is not to deny, of course, that in the pattern of political skyjacking or, more relevantly, the Symbionese Liberation Army's food for the poor ransom scheme in the Patricia Hearst affair, some insurgent Strangelove will not succeed in mounting an atomic terrorist attempt. It means merely that the political leadership of impoverished countries, even in the face of growing misery, will almost certainly not employ atomic blackmail as a means of forcing redistribution of the world's wealth. Thus, just as there is reason to be optimistic about the chances for peace among the world powers during the next quarter century--despite their great strength and continuing, if muted, hostility--there is no reason to be pessimistic about the disruption of that peace by assaults of the weak and starving (no matter how armed) on the powerful and well-fed. The international wars of the late twentieth century (excluding the possible armed struggle between Israel and the Arabs) will be brief, isolated, and generally ignored on the pattern, say, of the Honduran-San Salvador border struggle of 1969. Even in the case of a more spectacular and noticed conflict, e.g., the Indo-Pakistani struggle of 1970--brevity and isolation will tend to be the rule.

The likelihood of non-international armed conflict, i.e., civil

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*Irma Adelman and Cynthia Taft Morris, Economic Growth and Social Equity in Developing Countries, (Stanford University Press, 1973).

wars, has already been discussed.* As in the long struggle in Indo-China there are some of these that can, at times, be construed as international wars. However, as in cases such as Indo-China (where the result of the Geneva Agreements was, in effect, to redefine the struggle as a civil war), the trend is toward the isolation and ignoring of these, as well. Such conflicts, unlike international clashes in the undeveloped world, may very well be lengthy and they may disrupt agriculture with the result of exacerbating the food situation for significant populations, e.g., the Nigerian civil war of 1969-1970. Yet, since they will be fought at a relatively low technological level, the deliberate use of herbicides or other chemical pollutants with local or widespread environmental effects is unlikely.

In this connection, the likelihood that the rest of this century will see much war-related increase in the use of pesticides is not great. Consequently, the chance that pesticide policies developed with concern for the environment rather than for military exigencies can be applied not only in the United States but worldwide is enhanced.

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*See Walter Laqueur, "The Gathering Storm" Commentary, August 1974, reprinted in Current, September 1974, pp. 35-54. Laqueur assumes, however, that these internal upheavals (chiefly in Africa and on the Indian subcontinent) will necessarily involve the developed countries. Indeed, he argues that American policy should aim at "making the Russians assume responsibility for the well-being of the Indian subcontinent." This paper assumes the opposite.

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AGRICULTURAL FOREIGN AID POLICY[*]

During the 1975-2000 time frame, U.S. agricultural foreign aid policy can be considered as a function of trends in world agricultural supply/demand and political/military developments. These provide the opportunity/constraint context within which decisions relative to U.S. foreign policy response are made. It must be emphasized that regardless of the situations resulting from the working out of world economic and political trends, the range of foreign policy choices for the U.S. will be large. There is no set of circumstances the consideration of which will impose on the U.S. one foreign policy choice and, hence, one agricultural foreign aid policy response. That one choice will inevitably be made does not mean, in the mechanistic sense, that it was the inevitable choice.

Other trend papers completed for this study dealt with both the world political situation and the agricultural supply/demand situation over the study time frame. To summarize: the most probable political trend was one of continued, if precarious, peace among the major powers with continuing and sometimes costly civil and international struggles in and among the developing nations. The most probable agricultural supply/demand trend was that of increased production sufficient to meet basic world requirements, but not ruling out the possibility of localized periods of severe shortage and occasional famine in some areas of the undeveloped countries.

Within this context one can predict well-defined U.S. foreign policy trends. Even now the outlines of these policies are visible, and there are vocal and well-organized supporters for each. The trends may be summarized as follows:

1. Internationalist/hegemonic. This policy is a continuation of the policy pursued by the United States over the past twenty-five years. The U.S. perceives the world in light of its international interests and considers events in relation to these interests. High on the list of foreign policy objectives is the maintenance of world leadership. Failure to react visibly and effectively in any instance that can be defined as affecting American

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[*] Prepared by David MacMichael.

interest will be construed as weakening its claim to world leadership. Hence, foreign policy is activist. U.S. resources (military, economic, political) are mobilized for use in a wide variety of contingencies. The U.S. seeks support for its decisions and actions from other nations and international organizations but--as a matter of maintaining leadership--it does not ordinarily seek their participation in the decision making process. U.S. foreign aid policy is designed to support those within world bodies or in other nations who are amenable and responsive to U.S. leadership.

2. *Internationalist/cooperative*. This policy considers the U.S. an important and necessarily involved participant in world affairs with well defined national interests. It rests on a belief that these interests are best served through strengthening organizations for mutual, multilateral action. Emphasis is on finding points of common interest rather than on contention. Consultation, conciliation, and compromise leading to commonly agreed upon programs and activities are favored over rapid, unilateral action designed to produce a *fait accompli* to which others must adjust. Foreign aid policies are based in a "spaceship earth" philosophy and carried out by multinational agencies whenever possible.

3. *Neo-isolationist*. This policy sees more losses than gains for the U.S. in seeking either to control the world or to cooperate with it. Through such programs as "Project Independence" the U.S. seeks to reduce its level of interdependence and the consequent need to be involved with events outside North America or, at most, the Western Hemisphere. Foreign relations are primarily economic in nature and carried out wherever possible by private business firms. The U.S. retains a strong deterrent defense capability for use within a well defined sphere of interest but ignores events which do not appear to impinge immediately on it. Participation in the United Nations and other world bodies continues largely for the purpose of communicating with current American interpretations of its national interest and gaining understanding of other nation's perceptions of their interests. Foreign aid policy in support of such a trend consists of measured response to disasters in underdeveloped countries and participation to the extent necessary in the world banking and credit agencies that assist the world-wide trade of American firms.

At least for the next ten years it seems unlikely that Trend 1 will continue. Indeed, it seems in the process of running out very rapidly. However, it might be revived if there is prolonged economic recession which is interpreted as a result of "strangulation" by the oil producing countries and if the Soviet Union is seen as responsible for inducing them to carry out such a policy. In this case--especially if the other industrial nations decline to join in a united consumer front--the U.S. might choose to revert to the policy of the 1960s rather than appear--especially to its own voting public--as a "pitiful, helpless giant."

Under the internationalist/hegemonic policy, vigorous efforts to gain and maintain influence in those underdeveloped countries that have deposits of industrial raw materials would include the use of foreign aid, both to prevent them from joining cartels and to pry loose those already part of such cartels. Undoubtedly, "food as a weapon" would play a significant role in such a foreign policy.

U.S. agricultural policy would be coordinated with foreign aid policy. High levels of production of grains and other commodities would be maintained and government-controlled reserves would be established. Such stockpiles would be used as sources for rewards to cooperative nations. Furthermore, in times of shortage, the existence of stockpiles would serve to make credible and effective the witholding of commodities from uncooperative nations. In times of plenty the withholding of stocks from the market would be used as a reward, while dumping would serve as the means for punishment or intimidation.

Thus, the establishment of a governmentally controlled food reserve would become an essential foreign policy tool that would have to be supported by domestic agricultural policy. One can envision something like a National Security Commodities Act under the provisions of which the government would contract with producers for the delivery of specified quantities of "strategic" foodstuffs at market plus prices. To allay fear that the existence of such government holdings would put downward pressure on open markets there would probably have to be an arrangement for the destruction of stocks over a ceiling level. At the same time, in order to compensate for the tendency of government purchases to keep consumer prices high a variety of agricultural policies to encourage high levels of production for the domestic market would probably be employed. These might be used in conjunction with a number of consumer assistance programs such as expanded food stamp use, senior citizen food rebates, and school breakfast and lunch programs.

Since the underlying foreign policy aim under this trend is to maximize the effectiveness of U.S. agricultural productivity as a means of influencing other nations, there would be less emphasis in the foreign aid program on assisting other nations to achieve agricultural self-sufficiency. Even where the levels of per capita farm productivity in foreign countries are enhanced by foreign aid of technical or economic nature, there will be a strategic tendency to build into such aid reliance on a continuation of U.S. technological input in the form of seeds, fertilizers, pesticides, machinery and spare parts, and so forth. Where possible, American-controlled finance and credit machinery will underpin the agriculture of the assisted nation. Emphasis will also be placed on maximizing production of nonsubsistence agriculture (plantation growing of sugar, cotton, oilseeds, cacao, coffee, tea, etc.) to be traded for U.S. food crops rather than assisting the establishment of the means for self-sufficiency.

Adverse population growth rates and climatic changes insofar as they increase world reliance on American agriculture and, hence, make foreign nations more responsive to American desires will, within limits, be viewed as relatively advantageous. Hence, U.S. foreign assistance in areas such as population control may receive less emphasis.

Trend 2, U.S. foreign policy emphasizing international cooperation, is highly probable over the next ten years at least. Events giving impetus to this trend are: the Vietnam experience which resulted, among other things, in the relative diplomatic isolation for the U.S. with consequent loss of ability to command the responses of its allies; and the oil crunch which exposed some unsuspected economic vulnerabilities.

This is not to say that the United States has had a past policy of eschewing mutuality and international cooperation. However, due to the abovementioned circumstances especially, the trend could well be toward a greater commitment to cooperation and more relucatance to take independent action.

In the context of such a foreign policy the U.S. would be more likely to accept the view that its agricultural endowment, including the skills of its farmers and agricultural researchers, is a world resource. While citizens of the U.S. have first claim on it, the U.S. will not overtly claim that it can use its production of foodstuffs to coerce other nations.

This foreign policy stance is compatible with a wide range of strategies and approaches for the encouragement of world agricultural production. Such strategies might include U.S. participation in the creation of food reserve stocks under international control, concurrent participation in international programs to develop higher levels of agricultural production worldwide, support and participation in international marketing organizations, and participation in the establishment and operation of international famine relief organizations and operations.

In the short term, at least, this foreign policy trend would require a reversal of the current trend toward reduced levels of foreign assistance--reflected also in the foreign policy of other developed nations. In terms of agricultural policy, it would imply a maximization of U.S. agricultural production. However, stockpiling under conditions of high production would tend to put downward pressure on prices of agricultural commodities; consequently, price support and other mechanisms to guarantee American producers against adverse economic effects would appear necessary. Also likely will be the need to negotiate with the Common Market countries to overcome the market distorting effects of their agricultural policies and with the Soviet Union and COMECON to open up their system of crop information reporting. It can be argued that the ability of the U.S.

to succeed in these objectives will be enhanced proportionate to its demonstration of willingness to submit to a measure of international control.

To the extent that this policy is adopted and reified by the U.S. and other agricultural surplus countries--by and large also petroleum and industrial raw material importers--there exists the possibility of encouraging a greater degree of cooperation among raw materials producers. In essence, this policy entails coating the "food as a weapon" pill with international cooperation sugar.

A major aspect of this policy involves "spaceship earth" thinking. Hence, foreign assistance in such areas as population growth limitation, pollution control and environmental preservation would tend to assume greater importance. Thus, the same issues of production versus environment that have characterized domestic agricultural policy planning in the recent past would be more prominent in foreign assistance planning as well. Assuming a greater degree of U.S. response to the decisions of international bodies, environmental standards within the U.S. would increasingly conform to the international norms.

The neo-isolationist trend characterized by declining U.S. levels of foreign assistance, official and unofficial expressions of dissatisfaction with the United Nations, reduced overseas troop levels, and such programs as "Project Independence," reflects a desire to return to traditional American aloofness. It is a relatively strong trend; however, it is more likely to develop after 1980, and is more likely to act as a brake on complete adoption of other policies than to be itself the dominant policy trend.

However, it is quite possible that even under circumstances in which hegemonic or cooperative trends are strong in other areas of foreign policy and foreign assistance, U.S. agricultural policy will be characterized by isolationism. That is to say, there will be no attempt by the U.S.

government to control agricultural production in support of its overall foreign policy. The market (or producers' interpretation of the market) will determine what and how much is to be produced. There is evidence of such a trend in the recent movement away from New Deal and World War II inspired programs for government management of major commodity production, the strongly expressed opposition within the Department of Agriculture and elsewhere for the establishment of governmentally-controlled food reserves under either domestic or foreign auspices, and the increasing prominence of private grain trading firms and commodities options markets. (Suggestions have been made recently in high financial quarters that farmers, instead of seeking government protection from the gyrations of the commodities market, should themselves become more active as commodities traders on the major exchanges.)

Neo-isolationism combined with a free market, profit maximization approach would be compatible with whatever trend developed in world agriculture. However, since the U.S. foreign policy goals under the influence of this trend would be limited, programs of foreign assistance would tend to be laissez faire. Simply stated, the U.S. government would not seriously involve itself with programs to increase agricultural production worldwide nor to influence U.S. producers to coordinate their activities with any world scheme. It would be assumed that market forces and rational economic calculations based thereon would eventually result in better use of world agricultural resources than formal assistance programs. Naturally, U.S. technology would be deployed internationally but essentially through the medium of the private firm acting in its own interest rather than as part of the program of a government agency involved in some grand design.

These foreign policy and assistance trends would mesh well with a general economic trend toward greater reliance on the free market as opposed to government management. Certainly, the evidence for neo-isolationism within the U.S. has coincided with evidence of retreat from the governmentally-managed economy and movement toward more reliance on a free market or corporation-managed economy. If these trends reinforce each other, there will probably be greater resistance to government programs for environmental protection when these are seen as "interference with private enterprise."

On the other hand, a neo-isolationist foreign policy trend could coexist well with a more controlled domestic economy. If the consumer movement continues and grows stronger (as, with reference to agricultural policy, the new membership of the congressional agriculture committees might indicate) then agricultural production might be geared more closely to the exigencies of the U.S. domestic market. Foreign sales, import and export policies, crop quotas and pricing policies, maintenance or non-maintenance of stockpiles could be closely controlled in order to maintain adequate stocks for domestic consumption at relatively cheap prices. Foreign assistance policies would be interpreted and supported in the light of their effect on American urban consumers.

It is at least arguable that producers in a more closely controlled economy would be more amenable, grudgingly or not, to regulations governing the methods by which they produce. To the extent that production methods are seen as posing actual or potential health hazards for domestic consumers, there would likely be tougher health and environmental standards that would, among other things, tend to limit the use of pesticides even to the detriment of production maximization.

Enhancing the possibility of an environmentally oriented neo-isolationist foreign policy trend is the fact that there has been in recent years a partial identification of the isolationist tendency with environmental activists. Basic to their thinking is that the world biosphere cannot afford or support the continuance of a high level of economic growth.

Not only is it necessary, in their view, to adopt a more frugal, conserving, and ecologically sound style of life within the United States, but the encouragement of industrial growth and high technology and agribusiness styles of agriculture elsewhere in the world merely magnifies and perpetuates the problem. Furthermore, it is argued that foreign assistance has frequently exacerbated the situation of the poor within underdeveloped countries while it strengthened the control of elites. Increasingly it will be argued that American food aid to the underdeveloped nations is counterproductive since it encourages high population growth rates and allows their governments to indulge in projects of uneconomic industrialization while neglecting agricultural development

To a considerable degree the forces supporting a neo-isolationist foreign policy from environmental convictions would be ideologically comfortable with those in the internationalist/cooperative group. However, if they agree with William Paddock that in the matter of providing useful agricultural assistance "we don't know how" and with the Ehrlichs that such assistance is usually environmentally unsound anyway, there results a pessimism that changes the emphasis from "spaceship earth" to "lifeboat America." In the old tradition of American foreign policy the United States is seen as carrying out its international mission by providing the example at home, not by intervening abroad.

COMMENTS ON THE OUTLOOK FOR CANCER IN SOCIETY*

Introduction

This brief paper contains three sections as follows:

- Overview and assumptions: A description of the current U.S. health care system and descriptions of the major assumptions used in assessing the future impact of cancer.

- Key questions: Four important questions have been posed relating to the future prediction of carcinomas, per case treatment costs, social costs, and the outlook for a cure. This section defines each question and broadly describes historical and present trends affecting possible answers.

- Future sector values: This portion of the paper is a comparison of outcomes of the four questions as a function of the type of futures which may prevail in the next twenty years--Survival, Achievement, and Frugal.

Overview and Assumptions

An analysis of the future impact of carcinoma should include an overview of the U.S. health care industry which researches, detects, and treats various forms of cancer. U.S. health care expenditures are currently in excess of $120 billion. As reported by the Social Security Administration,[1] approximately $45 billion of this total is paid by various national, state, and local governmental entities.

The organization of the health care industry is relatively unique in contrast with other $100 billion components (defense, energy, food, etc.) of the U.S. economy. While other segments of the economy have tended to evolve into oligarchies (several major dominant entities), health care is still very close to a classical competitive model. There are thousands of unrelated hospitals and nursing homes, and over 300,000 largely unaffiliated physicians. Over 5,000 firms sell products such as equipment, supplies,

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*Prepared by Thomas Mader.

and drugs; no drug firm has more than an 8% share of the U.S. market. Thus, the medical environment in which cancer is detected and treated is very fragmented and varies greatly according to geographic region, local conditions, and areas of medical specialty.

Currently, the three most frequently mentioned variables affecting the health industry are National Health Insurance (NHI), an extended recession, and this year's crisis, malpractice. The following is a short discussion of these factors as overall parameters and their possible effect on the detection and treatment of carcinoma.

National Health Insurance as a concept implies comprehensive "cradle-to-grave" medical treatment. If the government were to embark on a broad NHI plan, this effort would imply the redirection of over $50 billion not currently paid by the government. This shifting of funds and the disruption of the health care community caused by a host of new regulations and procedures has become a major factor inhibiting the growth and acceptance of NHI.

With respect to an extended recession, as Pedrick[2] has suggested, the health care industry has shown interesting contra-economic trends. During the last 20 years, the one to two year recessions have all been characterized by increased hospital and physician utilization. Workers, fearing a layoff, tend to use their health care benefits more immediately--for elective surgery that had previously been delayed. (No comparable information, however, is available for the depression of the 1930s as the concept of third party medical payments was in the embryonic stage.)

As a point of speculation, an extended recession might be characterized by a decline in reported and actual cases of cancer. Reported cases might decline because less money would be available to support the reporting process. Theoretically, the central government budget would be severely threatened by declining tax revenues and increasing unemployment benefits and thus cutbacks in funding would diminish the amount of medical services available.

A further point of speculation would concern the possible decline in actual cases of cancer as a result of greater individual concern with other matters such as food and shelter. This line of reasoning parallels the "psychosomatic" hypothesis such that individual worry about a given medical problem may in some way result in the actual occurrence of the problem (cancer). For instance, certain family trees show a very high incidence of cancer over time.[3] Similarly, if people hear less and less about cancer, it is conceivable that cancer could become less widespread. Conversely, there are hypochondriacs who are constantly convinced they have cancer and yet still have not got it.

Malpractice, currently a subject of great concern in several states, is a phenomena generally restricted to high geographic growth areas of the 1950s to 1960s. New doctors and new patients arrived in these areas (California, Florida, Arizona, etc.) in substantial numbers. Numerous tenuous physician-patient relationships were formed.

Given the competitive status of the U.S. health care industry, the following assumptions have been made regarding the role of cancer-related activities in alternative future scenarios.

- The individual relationships between doctors and patients will remain as a very important component in the prevention, detection, and treatment of cancer.
- Physicians, the basic providers of medical services, will not be replaced to any substantial extent by paramedicals or physician-extenders.
- The U.S. health care system will continue to display "free enterprise" characteristics with only limited consolidation of health care providers.
- Access to the medical services of hospitals and physicians will remain difficult for people living in rural environments and the "inner" city. Medical doctors will continue to be a "privileged" class in society.

Key Questions

1. Is our ability to predict carcinogenic effects of chemicals likely to improve greatly (i.e., will there be a narrower confidence band around our risk estimates)?

Over the last 25 years, our ability to identify and classify new chemical structures has increased geometrically. Similarly, our awareness of the compounded effects of different chemical reactions has also experienced rapid growth. Each new research advance has brought with it an increased awareness of how much more there is to learn about the subtleties of molecular structures and reactions.

For the next 25 years, it can be speculated that these research advances will continue at a similar or an increased rate. Thus, more and more chemical reactions and structures will be identified and the "universe" of known chemical reactions will expand far beyond present-day knowledge. This knowledge expansion unfortunately will probably entail a concomitant expansion of the "bands of confidence" surrounding the interaction of these new chemical processes.

Our ability to predict the carcinogenic effects of known chemicals in animal studies has improved over the last decade. The replicability of these studies on human physiological processes is proceeding at a modest level; possibly there are as many as five carcinogenic chemical reactions which have been tentatively identified. More precise risk estimates for these specific chemicals have resulted in more precise prediction of long-term effects (narrower confidence bands).

While it appears likely for the future that the confidence bands for these 3 to 5 chemicals will narrow even further, it also appears likely--at least in the opinion of certain researchers here at the Institute (Dr. Tucker Helmes) and abroad (Dr. Peter Magee, Professor of Biochemistry, Middlesex Medical School, London, England)--that more and more carcinogenic chemical reactions will be clinically documented.

During this century clinical documentation of cancer has occurred in a variety of what is now called high risk occupations, namely

- Lung cancer in asbestos and uranium workers
- Bladder cancer among certain rubber workers
- Cancer of the liver in certain occupations with close exposure to vinyl chloride.

This documentation has generally occurred in situations where the workers had relatively long periods of exposure, close contact among themselves and their families, and a working environment characterized by limited exposure to sunlight and fresh air.

In the remainder of the 20th century, it is possible to speculate that more chemicals will be associated with carcinogenic effects and that the "bands" of confidence surrounding each will perceptively increase over time as interreactions are more fully understood. However, even though our ability to identify and predict the individual chemicals causing carcinomas will improve, there will be more and more chemicals and thus a continuance of the chemical/carcinoma regulatory problems.

2. Net of general inflation, will treatment costs for a given cancer case be likely to change in a discernable direction?

To date the treatment for individual cases of cancer has been characterized by increasingly sophisticated and expensive diagnostic and therapeutic procedures. Several assumptions can be made concerning the historical cost increases associated with these procedures, namely:

1. Most medical care, and cancer in particular, has not historically been characterized by "economies of scale" in which lower unit (per case) costs have resulted from more efficient treatment of larger numbers of cases. Effective medical treatment is often very dependent upon the quality and duration of individual patient/nurse/physician relationships. These relationships may often be diminished merely by the shortening of time a patient sees a doctor. In the near term, it may seem to be more "efficient" for a doctor to see three rather than two patients an hour. However, in the long run the overall health of the patients is probably enhanced

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if doctors can be allowed more time to consult with individual patients.

2. The government's efforts as a regulator and reimburser of health care expenses and services have not been characterized by any significant across-the-board cost savings. On the contrary, however well meaning these efforts have been, according to Schwartz[4] they usually have resulted in greater costs through the imposition of the inefficiencies of a bureaucracy (third party insurors) on what is essentially a one-to-one relationship (patient to physician).

   - As an example, the Congress has recently passed a Professional Standards Review Organization (PSRO) law in an attempt to reduce "unneeded" hospital admissions and patient lengths of stay. However, SRI's Health Industries Research group estimates the cost of this program in 1980 to be $1.1 billion--roughly equal to the anticipated savings!

Governmental legislators and planners have become increasingly concerned about the extent to which adequate health care services can be made available to the broadest number of people. With the introduction of national health insurance as a "campaign plank" by the Bull Moose party in the early 1900s, this issue has increasingly occupied the minds of responsible (and irresponsible) politicians and planners. Access to good, low cost health care services has been promoted as a "right" rather than an individual responsibility.

Regardless of whether or not individual health care is a right or a responsibility, the future seems to hold increasingly greater governmental interest, funding and regulation for health care. However, it remains to be seen how successful government will be in these cost containment and quality improvement efforts. It has been speculated that a government which has not had much success in providing the most fundamental of services (a roof over the heads of all citizens plus adequate money to buy food) will probably have even less success in fostering

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the much more subtle and sophisticated concept of quality, readily accessible health care.

Thus, for the future, as government interest in the funding of health care expenses in general and cancer treatment in particular increases, it seems reasonable to expect that these costs on a per case basis will continue to increase at a rate in excess of the rate of inflation of GNP growth.

Three of the major trends in the U.S. health care system over the last 25 years were as follows:

1. Formation of increasingly larger group practices and hospitals
2. Increased involvement of national and state governments as financers and regulator of medical care
3. Increasing complexity of the diagnostic and treatment process.

Each of these trends, regardless of cause(s), has resulted in higher per case treatment costs. Results of recent field contacts with important administrators at medical groups, hospitals, research facilities, and HEW appear to indicate that these trends are still in effect.

3. For a given type of carcinoma, will the prognosis for cure be likely to change? What about a shift of cases from fatal to prolonged treatment?

The only "cures" to date have fallen into two broad categories:

1. Medically documented clinical diagnosis and treatment relating to early detection and expensive specialized therapy.
2. Medically documented diagnoses of malignant terminal carcinoma in which the patients have recovered due to some currently inexplicable reason:
   - "faith" healing by nonmedical practitioners

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- "placebo" effect of drugs which have no "scientifically" documented therapeutic effects
- Act of God hypothesis in which a miraculous improvement has occurred.

The shift of carcinoma outcome from fatal to prolonged presents a dichotomy. On balance, the vast majority of the American public is not philosophically "sold" on the concept of preventive medicine, even though "early detection" has been widely proclaimed as a common sense approach to good health. Thus, even though preventive medicine is a "sound" concept, most people prefer to see doctors only when they feel they are actually sick.

In the early 1960s, A.M.H.T. (automated multiphasic health testing) as a concept generated a great deal of positive interest in the U.S., particularly on the West Coast. AMHT centers were established using paramedical personnel and minicomputers in free-standing facilities to perform low cost comprehensive preventive health examinations. Numerous "future forecasters" including SRI[5] predicted the existence of vast AMHT networks by the mid-1970s on the order of 1500 centers and 15 million exams annually. Reacting to these positive forecasts, over 100 centers were established in 1971 by hospitals, group practices, and medically oriented entrepreneurs. However, by 1972 the boom had become a bust. Numerous expensive ($250,000+) facilities were forced to close when their patient flow estimates were not met. In retrospect, most observers agreed that most of the "healthy" public has no interest in an annual examination.

Since a shift from "fatal" to prolonged treatment implies early detection, a change in the public's attitude must occur before case durations will shift significantly. Given the highly advertised correlations between smoking and lung cancer and increased per capita cigarette consumption, such a shift would appear unlikely.

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Thus, even though the prognosis for cure (or prevention) for given types of cancer should gradually become more favorable, a major shift in cases from "fatal to prolonged" may be unlikely given an unchanged attitude by the public toward preventive medicine.

4. Society, by its actions, seems to impute a higher cost placed on a cancer-caused death than on some other causes of death; it seems to go beyond differences in treatment costs or lost productivity. Whatever its origins, is this high valuation likely to remain?

The alternative social costs of different forms of death as perceived by society appear to be a function of several factors, namely:

- The relative suddenness of a form of death
- The perceived amount of productive life that has been shortened by an untimely demise
- The degree and duration of pain and unpleasantness caused by different forms of death
- The philosophic/religious beliefs held by societal segments with respect to the existence and/or quality of life after death.

It appears clear that many individuals in "mature" societies have placed a higher social cost on cancer-caused death than on cardiovascular or accidental demises. This higher social cost appears to be a function of two factors mentioned above, degree and duration of pain and lack of confidence in life after death. However, even in relatively similar mature societies such as Great Britain and America, wide variance does exist, for example:

- In Great Britain, the medical therapy for terminal illness is more inclined to use addictive drugs such as heroin and cocaine derivatives. The English "hospice" program emphasizes "death with dignity" through the use of very high levels of drug therapy. The prevailing U.S. medical therapy stresses very low levels of addictive drug utilization, even in terminal cases.

- The U.S. is often thought of as a more materialistic society having less "family" and "heritage" components than Great Britain. This materialistic component may often be achieved at the expense of firm religious convictions.

With regard to the continuance of the U.S. society's high valuation of the social cost of cancer-caused deaths, this trend will probably continue throughout the 20th century until some new plague, disease, or threat is widely acknowledged. It appears unlikely that the major philosophical deterrent to this trend (widespread sincere conviction in life after death) will achieve acceptance by the majority of the U.S. population in the foreseeable future.

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Dominance of Achievement Sector Values

Summary

High national concern manifested in substantial research and treatment programs. Prognosis for cure only marginally increased through technology and held back by the increasing incidence of "unexplained" psychosomatic problems and substantially higher treatment costs.

Quality of the Individual Patient-Physician Relationship

Diminishes as government reimbursement, regulation and bureaucracy drive an increasingly large wedge between the doctor and the patient.

Questions

- Ability to predict. Predictive ability increases as massive compulsory annual screening programs are instituted nationwide. Laws are passed mandating annual cancer exams in medium and high risk occupational categories.

- Change in per case treatment costs. More emphasis on technology generates increasingly complex and costly diagnostic and therapeutic techniques as National Health Insurance becomes widely available. Bureaucratic inefficiencies prevail.

- Prognosis for cure. Minor medical advances occur among the more esoteric forms of cancer.

- Social cost. Society continues to place a premium on cancer-related deatns. With further growth in mass media transmission, media decision-makers emphasize the tragedy of cancer among the prominent and highlight the "cancer crisis" periodically. Medicare health insurance coverage is extended in the 1980s to cover all people under 65 with cancer, as it was in the 1970s for people with kidney disorders.

Dominance of Survival Sector Values

Summary

Marginal concern with cancer as more pressing individual priorities takes precedence. "Survival of the fittest" philosophy becomes paramount. Social cost of cancer diminishes.

Quality of Physician-Patient Relationship

Enhanced as direct transfer of goods and services dominates the payment process. Physicians, while harder to access, become more motivated by humanitarian rather than financial motivations.

Questions

- Ability to predict. Less and less emphasis is placed on cancer prediction and more time and money are spent on merely bringing some form of first aid to the immediate needy public.

- Change in per case treatment costs. Treatment costs decline rapidly as less emphasis and funding are available for medicine. Public "bartering" of goods and services for medical care returns to the major role it occupied in the depression of the 1930s. Physicians accept food, clothing, and furniture for payment rather than paper currency.

- Prognosis for cure. The incidence of faith or psychic healing increases and is accompanied by a decline in the psychosomatic "worried well." Research falters as scientific groups experience major funding cutbacks and are unwilling to accept "unscientific" demonstrations of faith healing.

- Social cost. Individual priorities in medicine shift toward first aid, flu treatment, venereal disease and infant care. Medical practice shifts from specialties back to "community medicine" and the solo practitioner re-emerges as the dominant physician element.

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Dominance of Frugal Sector Values

Summary

Altered national concern for cancer--seen increasingly as psychosomatic--accompanied by a modest advance in the prognosis for cure, arising from a better understanding of the psychosomatic elements of cancer causes and cures.

Quality of Physician-Patient Relationship

Increases as interpersonal relationships become more selectively meaningful and important. Less third party and government health insurance benefits are available. More direct transfer of funds from the patient to the doctor. Growth of nontechnological medical breakthroughs through meditation and a better understanding of the psychosomatic health component.

Questions

- Ability to predict. No major changes occur either way as cancer is accepted as a fact of life, as inevitable for some people as death is for everyone.

- Change in per case treatment costs. Treatment costs remain largely unchanged and fluctuate in a manner roughly corresponding with overall inflation or deflation.

- Prognosis for Cure. Potentially major advances are made as scientific researchers become more interested in examining previously unexplainable "unscientific" cures.

- Social cost. Society becomes more concerned with the quality of life rather than the length. Health care becomes more of an individual responsibility rather than a government mandated right.

Summary

Cancer will probably remain an important future cause of death among the U.S. population. However, the degree to which cancer is prevalent in the future may vary according to the ways in which our society evolves. Three future scenarios--Survival, Achievement, and Frugal--appear to offer different prospects for cancer as follows:

- A survival sector may imply declines in the social cost of cancer and in the ability to predict its occurrence.
- An achievement sector may imply a better ability to predict cancer and substantially higher social and treatment costs.
- A frugal sector may imply a better understanding of the psychosomatic components of cancer and a better prognosis for prevention and cure.

The degree to which cancer can be detected, prevented, or cured in individual cases may be uniquely dependent on the quality of the short and long term relationships between individual patients and doctors. This relationship is felt to be most enhanced in the frugal sector.

	Alternative Futures		
Criteria	Survival	Achievement	Frugal
Questions			
• Ability to predict cancer	↓	↑↑	↑
• Change in per case treatment costs	↓↓	↑↑	→
• Outlook for a cancer cure	→	↑	↑↑
• Social cost of cancer	↓	↑↑	↑

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TRENDS IN WAYS OF LIFE[*]

Introduction

One of the basic ways of defining a society and depicting possible futures is in terms of cultural norms and the values of individuals. The underlying premise to such an approach is that societies tend to be self-consistent wholes unified at some level by commonalities of values. It is true that some societies are far more homogeneous in a cultural sense than others. The United States, over much of its history, has ranked among the most culturally diverse of the great nations. Even so, through a process sometimes referred to as the "melting pot," anomalies and mismatches among parts tend, over time, to smooth themselves out. To some rather considerable degree the mechanism of this smoothing involves the values held by the people of the society.

It seems clear that cultural and individual values are both shaped by and are shapers of the environment. External factors--economic conditions, technological change, world politics, and the like--tend to force values in 'smoothing"or "balancing" directions. For example, a people faced with famine may be expected to favor values which serve to reduce the central problem of starvation and to neglect essentially all other values for the duration of the emergency. At another level, an individual thrown in with a group holding views other than his own either flees the group, changes

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[*] Prepared by Arnold Mitchell.

his views to conform to the group, dissembles, or changes the views of the group to conform with his views. In each of these alternatives the action is designed to bring external reality into closer consonance (or the appearance of consonance) with inner values.

But values can be leading as well as reactive. In this case, the values "smooth" the externals, rather than the other way around. This type of self-consistency is evident in the change induced by spiritual and intellectual leaders. The leader, through his insight, changes the priorities of his followers, and in so doing may change hosts of traditions and hence radically alter the external environment. This phenomenon is expressed in poetry: "Two with a new song's measure can trample an empire down." Wartime produces a different kind of example: that of a people willingly undergoing personal privation in the service of a national need.

Whatever the exact circumstances, it seems that no society can long endure if the discrepancies between its internal values and external reality are too great. Indeed, students[1] of societal change often point to what Chalmers Johnson[2] calls "cultural dissynchronization" as a key element. This concept, in the form of a "J curve," is used by J. C. Davies[3] as a means of explaining revolution.

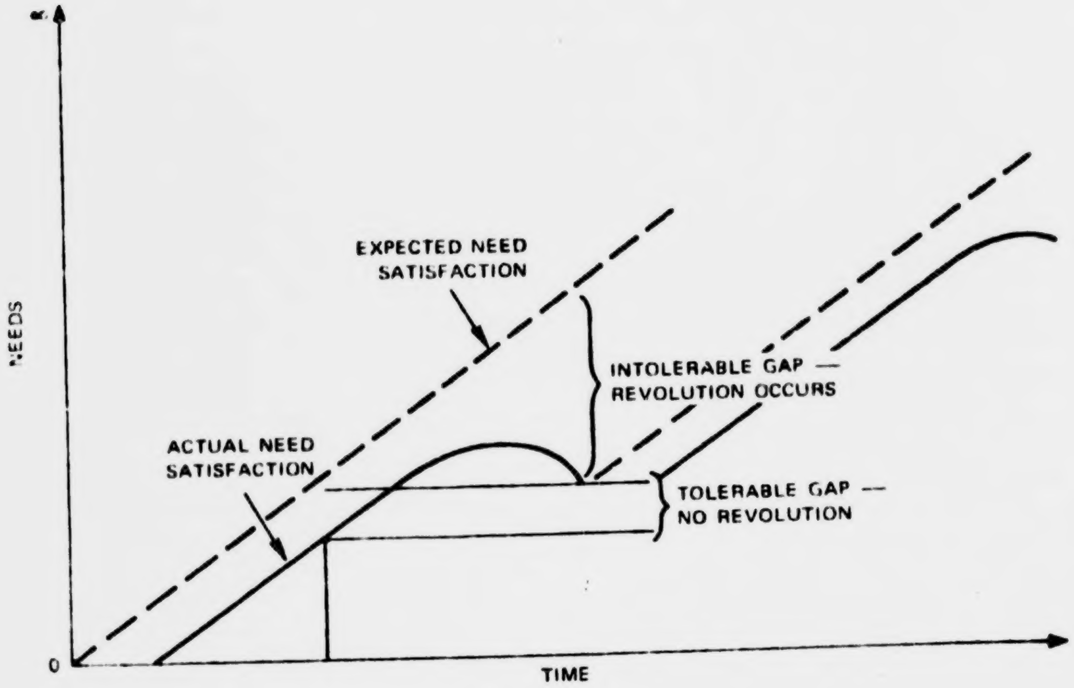

FIGURE 1 NEED SATISFACTION AND REVOLUTION

In the case of Figure 1 revolution occurs in an effort to bring the way things are into better alignment with expectations. (Whether the outcome achieves the aim is another matter.) But, of course, the adjustment is often in the opposite direction: expectations are lowered to fit circumstances. In either case, the anomalies between inner and outer factors tend to smooth out to make a self-consistent societal whole. Looked at this way, values (being shapers and the shaped) are, as it were, the medium through which some sort of self-consistence is maintained in the societal system. It is worth noting that, were it not for this self-consistency, we would have no basis for forecasting. In the absence of

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balances between what is and what people value, all events would be equally surprising and equally unsurprising. It is this fundamental relationship that justifies the use of values as an approach to examining the past, the present, and plausible futures.

Value Frameworks

The initial problem in forecasting from a values base is to devise some sort of simplifying framework. The dozens, if not hundreds, of personality traits, desires, viewpoints, and needs held in varying degrees by 213 million Americans must be reduced to a manageable number of clusters. This means that the typology must be built upon central value elements that radiate outward, so to speak, to create the personality characteristics, prejudices, wants, behavior patterns, and the like of the whole person. In addition to providing an organizing structure, the framework must be applicable to describing a society--that is, it must be comprehensive enough to apply to most people. These considerations rule out typologies based on so-called life style or psychographic descriptions of people, as they fail for the present aim because classifications run into the many dozens and even so do not portray a total society.

At least four kinds of approaches to values-based typologies seem feasible:

Psychological Growth. First, there are stages of psychological growth set forth by personality theorists. Among the big names in this field are Erikson,[4] Fromm,[5] Graves,[6] Maslow[7] and McClelland.[8] These scholars divide human growth into psychological stages, each of which is characterized by a unique constellation of values. (What is considered good and proper at one stage may be considered an abomination at another. This is illustrated by the fantastically different views of the morality of the acts of Lt. Calley and Daniel Ellsberg .) Maslow's hierarchy of human needs is perhaps the best known framework of this sort. Maslow's hierarchy has been used in several SRI studies to categorize values, to project plausible futures, and to measure the quality of life.

Images of Man. A second values framework might be called images of man. This approach makes central the notion that much of the future is determined by man's striving. The power of the image to lead, exponents of this framework say, can be stronger than the power of the pitchfork to prod. Fred Polak[9] and Kenneth Boulding[10] have dealt tellingly with this idea. The myths of men is a theme Joseph Campbell[11] has done wonders with. The approach forms the basis of an impressive SRI study (Changing Images of Man by O. W. Markley, *et al*[12]) which examines the implications of altered images of man's nature for the evolution of different kinds of futures.

Paradigms. A third framework is based on Thomas Kuhn's[13] insights into the importance of what he calls "paradigm" change to the advance of science. A paradigm is a model or pattern--in this case a mental model. Kuhn points out that the paradigms of science specify the classes of facts thought to be revealing of nature, the kinds of phenomena considered to be problems, the sorts of evidence required to explain the problems, and the types of findings which qualify as progress. A change in viewpoint in any of these significantly changes the picture. And so it is in the social sphere as well. By postulating various societal paradigms, one defines very different futures. For example, what would happen if today's society were to return to the paradigm of the middle ages, in which every misfortune from crop failure to the black death was imputed to the unalterable will of God? What if our paradigms justified investing the level of brains and resources in ESP, clairvoyance, or teleportation that we do in, say, computers?

Life Ways. A fourth and final values framework is called life ways. This approach has been developed at SRI over the past several years and forms the basis for a variety of futures-oriented and market-oriented studies.[14] The following pages outline this approach and indicate how it can be used to describe a society.

Six Life Ways

A life way differs from the more common concept of life style in being more focused on the inner, core drives of an individual. A person's way of life is defined by the complex of inner motivating, guiding, and meaning-giving values and feelings. Style of life, in contrast, describes the outward manner of living--how the inner drives are exhibited. Thus, a life way revolving around the inner drive to achieve fame could be expressed by a number of different life styles, such as athletics, domineering motherhood, entrepreneurship, multiple academic degrees, or Don Juanism. Hence, there are many, many more styles of life than there are ways of life.

To define a life way--or several life ways--one first identifies central or core elements of personality. With these in mind, one next strings together self-consistent patterns expressing these core elements to form a small number of clusters or constellations which are, in effect, life ways. Table I shows the seven elements and their variants used in the work at SRI.

The six life ways defined in this way are called Makers, Preservers, Takers, Changers, Seekers, and Escapers. Brief definitions follow. Accompanying each description is a table of the characteristic qualities of the life way in terms of the personality elements mentioned above. The characteristics are postulated accompaniments to the life ways; they are not based on survey results.

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Table I

LIST OF VALUES USED IN DEFINING LIFE WAYS

Life Goals

A changed social system
An exciting life
A prosperous life
A sense of accomplishment
A world of peace
A world of beauty
Equality
Family security
Freedom
Happiness
Inner harmony
Maintenance of tradition
Mature love
National security
Pleasure
Salvation
Self-respect
Social recognition
True friendship
Wisdom

Source of Meaning

Appearances
Avocation
Esthetics
Fame, status
Family
Inner self
Love
Money
Nature
People
Possessions
Power
Religion
Serenity
Societal issues
Work

Source of Truth

Authority
Empiricism
Intuition
Rationalism
Revelation

Psychological Need

Survival
Security
Acceptance
Mastery
Achievement
Self-fulfillment
Unfolding

Belief System

Behaviorism
Existentialism
Fundamentalism
Immanentism
Neo-Freudianism
Transcendentalism

Morality Pattern

Deference to authority
Eye-for-an-eye
Approval seeking
Duty
Social contract orientation
Universalistic, situational ethics

Time Orientation

Past
Present
Future

Makers. These are the men and women who, working effectively within the system, make it go. In U.S. society they are widely considered to be the leaders and the up-and-comers--the people epitomizing success. They are much involved in worldly affairs, generally prosperous, ambitious, and tend to see the world as their oyster. They congregate in the professions and among the managers and proprietors of business. They are also the efficient housewives and the leaders in hosts of voluntary organizations.

CHARACTERISTIC QUALITIES OF MAKERS

Hallmark Quality: Visible Achievement

Life Goals	• accomplishment • social recognition • prosperity • self-respect
Sources of Meaning	• work • power • money • family • possessions • fame
Sources of Truth	• empiricism • rationalism • authority (of other Makers)
Psychological Needs	• achievement • mastery • self-fulfillment
Belief Systems	• behaviorism • neo-Freudianism
Morality Patterns	• social contract • duty
Time Orientations	• future • present

Preservers. Persons with this life way, at ease chiefly with the familiar and proud of tradition, act as a sea anchor on change. Preservers are a powerful force promoting stability, solidity, and examination before embracing the new and different. They know that things could be worse--much worse. Less flamboyant than most, Preservers constitute much of the "silent majority." They are also the Makers who are winding down and the elderly recounting the glories of the past. They are the conservatives of some of the richest suburbs of the nation and the staunch status-quoers of middle America.

CHARACTERISTIC QUALITIES OF PRESERVERS

Hallmark Quality: Reverence for the Past

Life Goals	• Maintenance of tradition • national security • salvation
Sources of Meaning	• family • religion • institutions • work
Sources of Truth	• authority • revelation • empiricism
Psychological Needs	• security • acceptance
Belief Systems	• fundamentalism • neo-Freudianism
Morality Patterns	• eye-for-an-eye • duty • deference to authority
Time Orientation	• past

Takers. Takers coast. Making as few waves as possible, they take what they can from the system, feeling little obligation to the hand that feeds them. Takers live in the interstices of the work world, finding their pleasures outside the realm of making things go. They are attracted to bureaucracies and tenured posts, and the byways of business life. Many are conscientious, but little interested in world and societal issues. Rather, such Takers find their rewards in family, friends and conventional pleasures.

CHARACTERISTIC QUALITIES OF TAKERS

Hallmark Quality: Me First

Life Goals	• family security • maintenance of tradition • pleasure • happiness • friendship
Sources of Meaning	• family • appearances • avocation
Sources of Truth	• authority • rationalism • revelation
Psychological Needs	• security • acceptance • survival
Belief Systems	• behaviorism • neo-Freudianism • fundamentalism
Morality Patterns	• deference to authority • approval-seeking • duty
Time Orientations	• present • past

Changers. Changers tend to be answer-havers; they commonly wish to change things to conform with their views. Hence, they are the critics, the protesters, the radicals, libbers, advocates, and complainers--and a significant segment of the doers. Their focus is chiefly outward. They are concerned with and sometimes stridently attack almost every aspect of private, institutional, and cultural life. But the concern of some is inward. These are the Changers who, having found meaning for themselves in inner processes, press their insight upon others.

CHARACTERISTIC QUALITIES OF CHANGERS

Hallmark Quality: Cultural Dissynchronization

Life Goals	• changed social system • excitement • accomplishment • peace • equality • freedom • social recognition
Sources of Meaning	• societal issues • fame • institutions (negative) • people
Sources of Truth	• rationalism • intuition
Psychological Needs	• mastery • achievement • self-fulfillment
Belief Systems	• neo-Freudianism • existentialism • behaviorism
Morality Patterns	• social contract • universalistic • duty
Time Orientations	• future • present

Seekers. These are the ones who search, often gropingly, for a better grasp, a deeper understanding, a richer experience, a universal view. The pathways of their seeking and the rewards sought tend to be internal. They want to unfold. Sure of themselves in a profound way, Seekers have the courage to take seriously the unproven; stimulated by the unknown, they are willing to face what they find within themselves; intuitive, they are willing to live by rules not evident to others; global in their approach, they often are the originators and promulgators of new ideas. They are people with a fondness for paradox. Sometimes unrecognized by their contemporaries, Seekers are often seen in history as the great spirits and seminal thinkers of their times, whether in the professions, the arts, or practical affairs.

CHARACTERISTIC QUALITIES OF SEEKERS

Hallmark Quality: Inner Search

Life Goals	● inner harmony ● accomplishment ● mature love ● beauty ● equality ● peace ● wisdom
Sources of Meaning	● love ● inner self ● esthetics ● people ● nature ● serenity
Sources of Truth	● intuition ● empiricism
Psychological Needs	● self-fulfillment ● unfolding
Belief Systems	● existentialism ● transcendentalism ● immanentism ● neo-Freudianism
Morality Patterns	● universalistic, situational ethics ● social contract
Time Orientations	● present ● future

Escapers. Escapers are the lotus eaters. For whatever reason, their chief life drive is to escape, to get away from it all, to shuck the pressures and fixities and demands of everyday. Escape takes many forms. One type runs from extreme dropoutism, to addiction, alcoholism, and mental illness. Another type ranges from obsession with mysticism to inner worlds of dreams and fantasy à la Walter Mitty. Escapism partakes of alienation, anomie, and boredom. It afflicts every age group and social class. Escapers can not, or will not, cope.

CHARACTERISTIC QUALITIES OF ESCAPERS

Hallmark Quality: Flight From Reality

Life Goals	● happiness	● pleasure	● freedom
	● salvation	● excitement	
Sources of Meaning	● religion	● inner-self	● nature
	● avocation	● serenity	
Sources of Truth	● revelation	● intuition	
Psychological Needs	● existence	● self-fulfillment	● unfolding
Belief System	● fundamentalism	● transcendentalism	
	● immanentism		
Morality Patterns	● deference to authority	● universalistic	
Time Orientations	● past-present-future (blurred)		

It is obvious, of course, that no handful of life ways can describe all variations within a large and diverse population. It is also true that some people change from one life way to another--a fascinating as well as important phenomenon. Moreover, a person can have one way of life in one arena of living and another elsewhere. Thus, a man may be a Maker at work, a Preserver in his investing habits, and an Escaper in his home life. Despite such problems most people seem to be identifiable in terms of a dominant life way pattern.

Distribution of Life Ways

How are these life ways distributed in the adult population of the U.S. and how can they be used to describe a society?

Our best guess as to the distribution of life ways in the U.S. during the early 1970s is that about a third of the population are Preservers; Makers and Takers are equally numerous at slightly over 20%; the remaining 25% is divided in roughly equal parts among Changers, Escapers, and Seekers.

On this basis, three-quarters of the population--that is, the total of Preservers, Makers, and Takers--is generally accepting the way things are. A fourth--Changers, Escapers, and perhaps Seekers--basically wants change.

This points to a way of allocating the life ways in terms of social norms. Society might be thought of as a spectrum of values with a vertical line in the center representing the cultural norm. On either side lies some form of deviance from the status quo.

Since Makers and Preservers constitute the heart of the status quo, they are placed on either side of the center line. The Maker life way tries to nudge the norm in the direction of evolutional development; Makers want some, but not radical, change. The Preserver life way presses in the opposite direction; Preservers would like a return to yesterday's ways. On either side of these great middle groups are life ways fartner removed from the cultural heartland--Changers and Seekers on the develop/reform side and the Takers and Escapers on the rigidify/avoid side. This arrangement is shown in Figure 2. The curve in Figure 2 approximates the life ways distribution. This kind of spectrum is, of course, wholly relative to current definitions of norms.

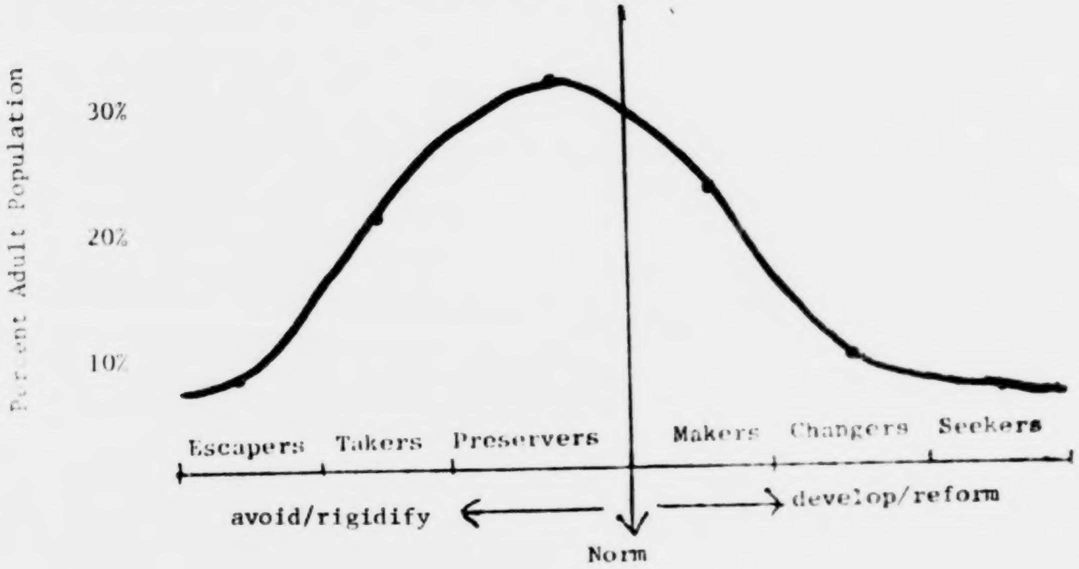

FIGURE 2 DISTIBUTION OF LIFE WAYS AROUND CULTURAL NORM--U.S. IN EARLY 1970s

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The most important thing about the distribution curve in Figure 2 is the general correspondence between the numbers of people in the life ways and cultural norms. The two center groups of Makers and Preservers make up over half the population, the next two groups contain about 30%, and the two outermost groups about 15%.

Overlap between life ways and cultural norms is not to be taken for granted. Figure 3 shows some hypothetical distributions for different societal conditions. For example, in a classical primitive society there is an enormous concentration in the traditional mode. Hence, the huge hump in the Preserver slot. In an agrarian society undergoing a transition to industrialization, the power is in the hands of the Makers and Changers, but the largest share of the population remains in the Preserver mode.

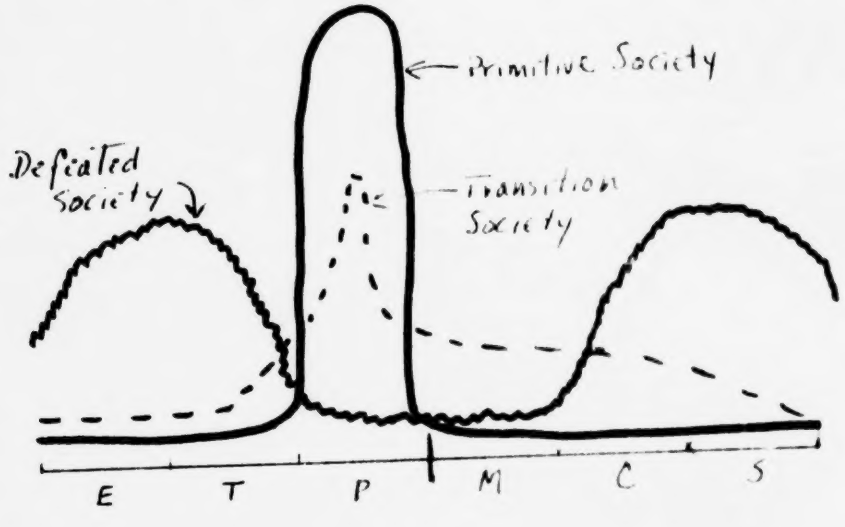


FIGURE 3 LIFE WAY PROFILES FOR VARIOUS SOCIETAL CONDITIONS

This gives the curious distribution of the dotted line. A nation defeated in war or undergoing severe depression would display the pattern of the wiggly line: humps on the Escaper and Taker end and on the Changer/Seeker pole but paralyzingly low in the cohering and building modes represented by Preservers and Makers.

The overall message, of course, is that stable societies show life ways clustered about their cultural norms--whatever those norms may be. Unstable societies show the opposite pattern. This generality suggests the usefulness of tracing profiles for past years and prospects for the future. But first it seems necessary to comment on the mechanisms of societal change as manifested in life ways.

Interpreting Life Way Profiles

In interpreting the meaning of changing national profiles of life ways, three interrelated factors must be considered.

1. The number of individuals in each category
2. The appropriateness or fittingness of values and ideas coming to the fore
3. Changing cultural norms

Over the long haul the percentage of people in the various categories may be the dominant feature, but in the short haul the salience of the idea is more influential. This salience is compounded of two aspects: (1) The appropriateness of the notion to the national mood and situation and hence (2) the number of followers it attracts across the spectrum of the life ways. The recent history of the environmentalist movement illustrates the importance of salience. The environmentalist viewpoint has its origin within the ranks of Changers. Studies made during the oil embargo show that "true environmentalists" (defined as active in an environmentalist organization) numbered between 2% and 5% of the adult population.[15] In some areas, however, their ideas attracted the support of over 60% of the population. A parallel phenomenon occurred on college campuses during the late 1960s. Only about 2% of students were "activists," but their causes drew support from at least half of the student body.[16]

Perhaps one can generalize to the following principles. At any given time a society will be centrally concerned with some small number of broad issues--probably not over a half dozen. These society-wide issues are "ideas whose time has come." This is what gives them saliency at a given point in history and what accounts for the generalized support they suddenly draw from a broad spectrum of the public. Hard-core exponents of a given view may or may not change in number throughout pulsations of saliency. Nor does it matter as much as one might think in which life way the idea finds its most congenial home. It further seems that the manner of presenting ideas may be less important than is usually thought. It is suggested that few ideas gaining saliency are truly "new"; rather they are more-or-less suddenly appropriate or fitting and are picked up for this reason. An analogy is with the disease that suddenly spreads from germs perpetually within the body which were unable to multiply until suddenly "freed" by changed conditions within the surrounding host.

It is through some such saliency phenomenon that many ideas get a hold on the society in general. If the notion serves well, it may, over time, become part of the cultural norm and hence be adopted as one of the givens by the life ways representing the status quo (no matter where the notion originated). So it is, for example, that the initial "radicalism" of progressive education, the New Deal, or labor's rights have penetrated into the culture. This means, in effect, that in the long run the percentage of people espousing a value will determine its ultimate impact.

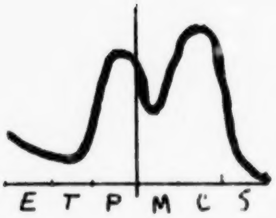
The fact that yesterday's radical is often tomorrow's conservative points to the importance of slow changes in cultural norms in defining the various life ways. Anyone in 1910 who suggested that income taxes might appropriately rise to such astronomical levels as 10% would surely have been regarded as a Changer or worse. Today such a view would be regarded as that of an arch conservative. The point, of course, is obvious: what is regarded as Preserverism or Makerism or Escape depends wholly on the prevailing norm. An interesting study of the political attitudes in college generations from the 1930s to the 1960s reveals that the opinions of individuals change less over the years than does the "background" or national norm.[17] The often-noted phenomenon of growing conservatism with age thus owes at least as much to national drift of viewpoint as it does to change within the individual.

Past National Profiles of Life Ways

In this section an attempt is made to sketch the national life way profiles of the U.S. throughout its history, with emphasis on the last quarter century. These profiles are designed to show the broad national timbre of the times. Obviously, any historian will wish to look much more deeply into the trends and conflicts underlying the macro picture. This exercise gives some sense of the uses and limitations of life ways as a vehicle for describing a society and its ebbs and flows over time. It also clarifies the value of examining alternative futures from the perspective of shifting ways of life.

1776 Era

In the absence of specific data, one may speculate that a mood of Changerism (despite a large quota of Preserverism representing the Tories) must have dominated the country's leadership during and immediately following the revolution. As the excitement of revolutionary days receded with the decades, a powerful sense of Preserverism took its place as a temporary means of solidifying the glory of

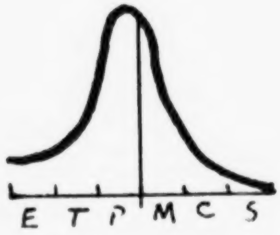


1776

the recent past. This kind of phenomenon was evident in Russia thirty years following its revolution and seems also to be present today in Mainland China. The image here is one of a moving backdrop: the Changers of 1776 became (without changing!) the Preservers of the early 1800s. In fact, elected presidents of the early 1800s were drawn from the supply of great revolutionaries created a generation earlier.

1800-1850

But Preserverism with its emphasis upon tradition does not seem a natural state for a young nation opening new frontiers to the West, building cities in the East, developing an agricultural kingdom in the South, and clearly in great need of the industrial way of life making such spectacular advances in the far-away land of England. The English may well have served as an unconscious model for the new Americans, for achievement motivation was at all-time high levels (based on analyses going back to 1400) in England during the 1776-1830 period.[18]



Early 1800s

In The Achieving Society McClelland reports data, shown in Figure 4,[19] that, in fact, suggest the young U.S.A., as the "founding generation" died off, began to develop a motivation pattern primarily associated with Makerism. Certainly achievement motivation and the patent index indicate a Maker Life way.

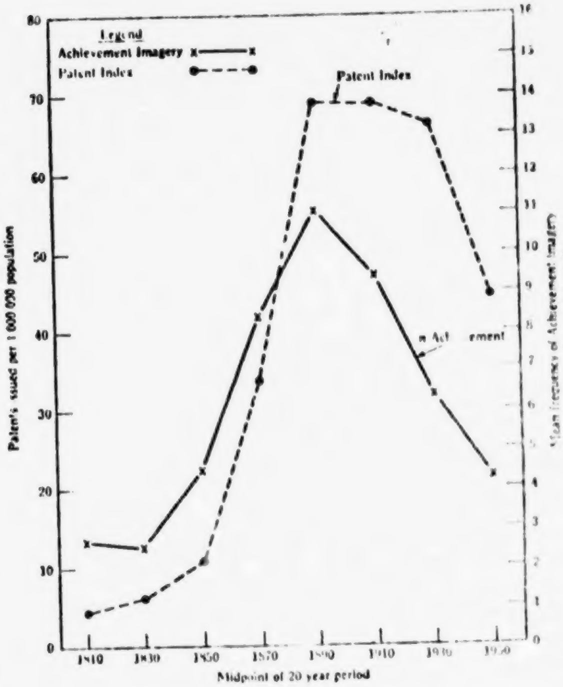
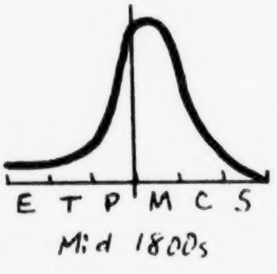


FIGURE 4 MEAN FREQUENCY OF ACHIEVEMENT IMAGERY IN CHILDREN'S READERS AND THE PATENT INDEX IN THE UNITED STATES, 1800-1950



What seems to have been happening in the first half of the 19th century was the rather slow accumulation of an infrastructure able to take advantage of an industrially-oriented, achievement-driven kind of Maker. By about 1850, the take-off point seems to have been reached.

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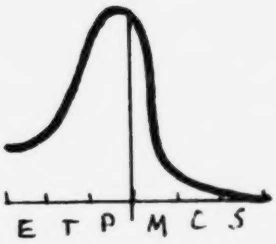
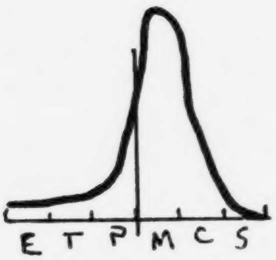
1850-1900

This was a period of rapid, intense industrialization in the U.S. The main source of growing numbers of Makers in this period was the Preserver life way.

The rise in Makerism was so powerful, however, that it probably drew from other life ways as well. It's worth noting, however, that the principal event of these decades--the Civil War--bespeaks a continuing deep adherence to tradition, especially in the South where Escapism and Takerism were also prominent. The inference is that Makerism-admixed with Changerism--was at remarkably high levels in the North.



South, 1860



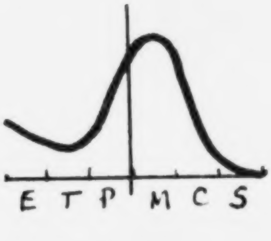
North, 1860

1900-1930

After a half century of increase, during which industrialization advanced rapidly, the trend in achievement motivation turned suddenly downward around 1900. This was the time of captains of industry, the Horatio Alger legend, and the worldwide image of America as the land of limitless opportunity and plenty. This was the time when the poor of many lands flocked to American shores, not to find freedom as in earlier times, but to share in the American dream.

Monolithic Makerism in the industrial North and Mid West, partly by virtue of its success, seems to have created a series of complex reactions, chiefly among the ranks of Changers. First was the emergence of unionism and soon the spectacle of bloody strikes--a direct reaction to the Maker life way. Second came women's suffrage and agitation for birth control. Even the male demesne of the corner saloon came under attack.

In this period another significant reaction was taking shape. The iron grip of the Protestant ethic on the cultural heartland of Preservers and Makers was loosened by the rise of respectable Escape. National heroes and heroines populated the fantasy world of the Silver Screen. For the first time athletes were paid more than presidents. By the 1920s the popular image of American society was that of the empty-headed flapper, the rich effete young man, the "sugar daddy," and--in the background--the cigar-smoking industrialist and ruthless market manipulator. The move to the cities was in full swing. Experimentation was rife in education and in the market place. And World War I



1920s

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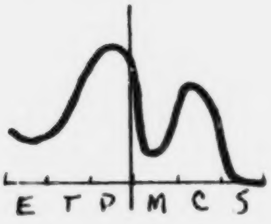
gave many Americans their first inkling that there was a world beyond Main Street. So it seems that the pre-depression twentieth century was a period of diversifying life ways, still dominated by the values of that pragmatic, rugged individualist, the Maker, but increasingly influenced by Changer values.

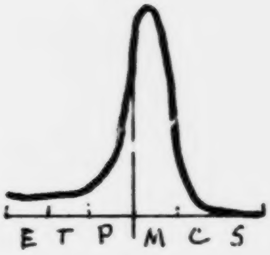
1930-1940s

The depression of the 1930s brought about a dramatic shift in national life ways. The depression was, of course, widely seen as a failure of Makers. Beyond that the change from Hoover to Roosevelt was a clear manifestation of Changerism. This profound change began a still-gathering trend toward collective responsibility for societal and even for private well-being. By changing national standards the shift converted Makers of the 1920s who disapproved the "new deal" into Preservers or Takers or Escapers. The change was so great as to cause many Escapers and Seekers to enter the active arena as Changers. And for the first time some sort of official validation was offered for the Taker way of life--validation in the sense that frontier type of individualism (implying the individual and his family was pitted against a recalcitrant world) no longer was the only acceptable way to be. The over-all picture is one of radical scrambling of old life way patterns. The most prominent feature was the development of a trough in the Maker slot.



Depression

But this was not to last long. The traumatic experience of World War II produced a singleness of purpose reflected in a monolithic life way pattern. The wartime focus on winning rather than the depression-bred emphasis on not being defeated suggests a swing away from the Preserver-Taker-Escaper patterns toward that of the Maker. In particular, the Taker life way was unacceptable during the war years.

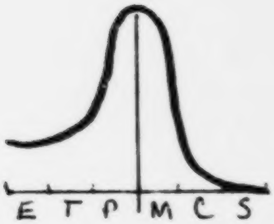


Wartime

1950s

The U.S. emerged from World War II with a sense of success, well-being, and power, although there were those who believed the switch from a wartime to a civilian economy would revive the well-remembered depression. But this fear proved unjustified, and the nation was launched upon a prolonged period of prosperity.

Throughout the 1950s Preservers and Makers predominated. These were the placid Eisenhower years--the years of the lonely crowd--when concern with "outer directedness" was so overwhelming as hardly to be disturbed even by such momentous events as the Supreme Court's civil rights decision of 1954. This was prosperity in the American tradition.



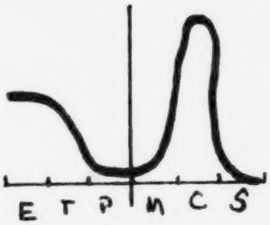
1950s

At the end of the decade, polls[20] showed Americans to be concerned chiefly with such perennial, apolitical matters as health (40%), better standard of living (38%), achievement of one's children (29%), and better housing (24%). High school students preferred Republicans to Democrats. On college campuses dwelt the Silent Generation. Throughout the decade a majority of blacks expressed themselves as satisfied with family income, their work, and with housing. But this relatively halcyon national state of affairs was not to last long.

1960s

The social explosions of the 1960s have been so extensively documented and publicized as to need only brief mention here. The so-called ghetto riots of the mid 60s, the campus unrest of the late 60s, and public reaction to Vietmam were the key events.

These events reflected a deep alienation. David Schwartz in Political Alienation and Political Behavior[21] shows that political involvement on the part of whites tends to reduce alienation by heightening the individual's perception of the efficacy of politics and civic organizations. But the opposite is true for blacks. The greater their involvement in civic activities the greater their sense of alienation. Hence, despite a tremendous rise in activistic Changerism among the blacks, the urban riots burst upon an unaware nation.



Blacks, 1960s

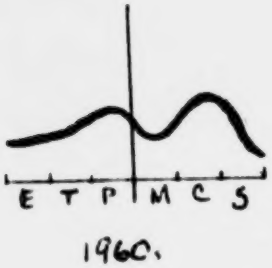
In Schwartz's terminology the 1960s produced a sharp national rise in TVC (threat from value conflict), SI (percieved system inefficacy) and PI (perceived political inefficacy). Analyses of Gallup polls for the 1950-62 period show that the percentage of respondents giving answers indicating alienation jumped from a mean of 4.8% for the 1950s to 16% for the 1960-62 interval.[22] The mean proportion of respondents feeling estranged from political parties jumped from 18% to 35% over the same period. And there was a 10% increase (to 60%) in the number wanting reforms of the polity.

The evidence seems clear that the decade opened with rising dissatisfaction levels. It is just as clear that levels continued to rise, spawning such side affects as assassination, crime, drug use, and a familiar host of others. Not surprisingly, alienation also spawned the intimacy of crowds (Woodstock, marches, hip dress, communes, etc.) and the togetherness of political movements (consumerism, environmentalism, various social causes, etc.). Possibly less groupy and probably less political were movements directed more inward than outward--such trends as humanistic psychology, transcendental meditation, Yoga, Zen, consciousness expansion, fundamental religion, and the paranormal.

Essentially without exception, these movements were directed against "the establishment," meaning the Preserver and Maker life ways. Vietnam, of course, was a prime focus, but so was "big business." The crimes of those in power, it seemed, were worse than the crimes of the less favored.[23]

No matter where one looks, there was demand for change. Many of the movements seem definitely to have their roots in the Changer pattern. However, for the first time in American history the inner search epitomizing the Seeker showed up in large numbers of people. Moreover, there is no doubt that components of many of these movements reflect Escaper traits. And there are those who feel that Takerism ran rampant in the violence accompanying the 1960s.

Overall, the decade represents a fall in dominance of the Maker--and, to a lesser extent, the Preserver--pattern accompanied by sharp increases in Changerism. In many ways the most interesting development was the emergence of an appreciable Seeker group. This broad pattern is similar to the one noted for the 1900-1930 period: a shattering of monolithic adherence to Maker-Preserver values with a rather sudden widening to embrace other life ways. In both cases, it can be argued, it was the success of the core system that facilitated its shattering by (1) providing the physical means of leading other kinds of lives and (2) failing to provide the emotional, intellectual, and social variety that a successful people needs. The latter item is particularly significant because it suggests that a society under duress or heavily engaged in competition of some sort can live happily within a



narrower range of values than a more relaxed, better satisfied society or than a society which has largely achieved its aims.

1970s

Yankelovich in The New Morality[24] compares the late 1960s with the early 1970s in these rather flamboyant words (survey made in the Spring of 1973):

> These first few years of the decade of the 1970s point to vast changes in the complexion and outlook of an entire generation of young people. Indeed, so startling are the shifts in values and beliefs between the late 1960s, when our youth studies were first launched, and the present time that social historians of the future should have little difficulty in identifying the end of one era and the beginning of a new one. Rarely has a transition between one decade and the next seemed so abrupt and so full of discontinuities. Listed below, in schematic form, are almost twenty large-scale changes revealed by the research as having occurred between the late 1960s and the early 1970s.

Late 1960s	Early 1970s
The campus rebellion is in full flower.	The campus rebellion is moribund.
New life styles and radical politics appear together: granny glasses, crunchy granola, commune-living, pot smoking, and long hair seem inseparable from radical politics, sit-ins, student strikes, protest marches, draft card burnings.	An almost total divorce takes place between radical politics and new life styles.
A central theme on campus: the search for self-fulfillment in place of a conventional career.	A central theme on campus: How to find self-fulfillment within a conventional career.

Late 1960s	Early 1970s
Growing criticism of America as a "sick society."	Lessening criticism of America as a "sick society."
The Women's Movement has virtually no impact on youth values and attitudes.	Wide and deep penetration of Women's Liberation precepts is underway.
Violence on campus is condoned and romanticized, there are many acts of violence.	Violence-free campuses; the use of violence, even to achieve worthwhile objectives, is rejected.
The value of education is severely questioned.	The value of education is strongly endorsed.
A widening "generation gap" appears in values, morals, and outlook, dividing young people (especially college youth) from their parents.	The younger generation and older mainstream America move closer together in values, morals, and outlook.
A sharp split in social and moral values is found within the youth generation, between college students and the noncollege majority. The gap within the generation proves to be larger and more severe than the gap between the generations.	The gap within the generation narrows. Noncollege youth has virtually caught up with college students in adopting the new social and moral norms.
A new code of sexual morality, centering on greater acceptance of casual premarital sex, abortions, homosexuality, and extramarital relations is confined to a minority of college students.	The new sexual morality spreads both to mainstream college youth and also to mainstream working class youth.
The challenge to the traditional work ethic is confined to the campus.	The work ethic appears strengthened on campus but is growing weaker among noncollege youth.

Harsh criticisms of major institutions, such as political parties, big business, the military, etc., are almost wholly confined to college students.	Criticism of some major institutions are tempered on campus but are taken up by the working class youth.
The universities and the military are major targets of criticism.	Criticism of the universities and the military decrease sharply.
The campus is the main locus of youthful discontent; noncollege youth is quiescent.	Campuses are quiescent, but many signs of latent discontent and dissatisfaction appear among working-class youth.
Much youthful energy and idealism is devoted to concern with minorities.	Concern for minorities lessens.
The political center of gravity of college youth: left/liberal.	No clear-cut political center of gravity: pressures in both directions, left and right.
The New Left is a force on campus: there are growing numbers of radical students.	The New Left is a negligible factor on campus: the number of radical students declines sharply.
Concepts of law and order are anathema to college students.	College students show greater acceptance of law and order requirements.
The student mood is angry, embittered, and bewildered by public hostility.	There are few signs of anger or bitterness and little overt concern with public attitudes toward students.

In 1971, 1972, and again in 1974, Americans were almost as optimistic about their personal futures as in 1959 and 1964, but definitely thought the nation was worse off than it had been five years earlier. By 1974, on a national level, worries revolved around economic instability, integrity in government, and national unity. Personal hopes centered (as earlier) on matters of health standards, aspirations for children, and a happy family life.[25]

Among blacks, satisfaction indices for income and work turned down from the higher levels of the 1960s, although the reverse pattern emerged with respect to housing.[26]

The 16 demands upon business indicated in a 1972 poll[27] to be either "top priority" or "potentially explosive" were:

1. Clean up water pollution
2. Clean up air pollution
3. Safer/healthier products
4. Truth about products/companies
5. Truth about prices/values
6. Equal opportunities for women
7. Protect natural resources
8. Restrict advertising
9. Improve product quality
10. Special attention to minorities
11. Protect jobs
12. Protect privacy
13. More on-job training and education
14. Change government priorities
15. Meaningful work
16. New "human rights"

Even as these demands were being voiced, Richard Nixon was elected by a record landslide.

What seems to have happened in the first half of the 1970s is this:

1. The violent events of the 1960s were widely seen as excesses emerging from too much permissiveness and too little good old-fashioned discipline. This led to the change in style on campus and to the rush to solid Republicanism and law and order politics represented by the election of 1972.

2. Simultaneously the "new values" of the late 60s were not abandoned although, politically, they seem to have been laid aside for the time being. Thus, Yankelovich [28] reports that the avant garde campus values of the 1960s entered the cultural main stream in the early 70s; simultaneously social criticisms and demands upon business and "the system" continued.

The picture, then, is of a temporary and expedient swing to the Preserver mode in reaction to the wildnesses of the Changer-oriented 60s. Even as this occurred confidence in institutuions and attitudes toward business deteriorated:

CONFIDENCE IN INSTITUTIONS [29]

	Percent Expressing Confidence		
	1966	1971	Difference
Television	25	22	- 3
Organized Labor	22	14	- 8
Advertising	21	13	- 8
Medicine	72	61	- 11
The Press	29	18	- 11
Organized Religion	41	27	- 14
Mental Health, Psychiatry	51	35	- 16
Executive Branch of Government	41	23	- 18
Congress	42	19	- 23
Education	61	37	- 24
Scientific Community	56	32	- 24
Local Retail Stores	48	24	- 24
Supreme Court	51	23	- 28
Big Companies	55	27	- 28
Banks, Financial Institutions	67	36	- 31

Source: Harris national surveys, reported in New York Post,
October 25, 1971.

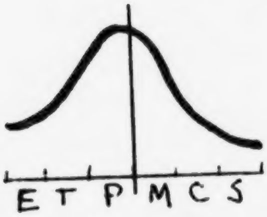
OVERALL ATTITUDE TOWARD BUSINESS[30]

	Percent						
	1959	1961	1963	1965	1967	1969	1971
Little Approval	52	55	52	47	46	56	60
Moderate Approval	28	27	27	31	32	26	27
High Approval	16	15	18	20	20	15	11
Unclassifiable	4	3	3	2	2	3	2

Source: Opinion Research Corporation national survey reported at the White House Conference on the Industrial World Ahead.

This situation suggests a deep schizophrenia--a tenuous, defensively inspired support of the Preserver mode combined with doubt as to the merit and efficacy of the system.

A sense of the depth of the confusion is provided by a 1972 poll[31] on attitudes toward government. 21% said a "big change" would be required in government in the next 10 years, 34% said "some change," and 45% said "keep as is." What is astonishing is the voting pattern on "keep as is." Only 35% of those with less than high school education so voted, versus 48% of both high school and college graduates, and 70% of the "forerunner" postgraduate group! This finding is wholly unexpected on the basis of earlier survey results.



Early 1970s

Such was the setting at the start of Nixon's second term. Because of the underlying doubt, the events of Watergate and all that they connote produced a political wipe-out of unprecedented proportions in American history.

The nation's life way profile in early 1975 might be described as a "tunnelled" Preserver/Maker society. The impact of Watergate is not yet clear except that it has undermined--"tunnelled"--without yet clearly having altered the 1972 profile. This is a society held together as much by doubt as to what to do as by belief in what is being done.

Future National Profiles of Life Ways

Classes of Futures

Starting from the fragile life way profile of 1975, there appears to be three plausible directions of evolution:

1. Conventional Futures. These futures would flow from solidification of the present profile as a result of successful political and corporate leadership by those now in power. This kind of future might be called Status Quo Extended, the Achievement Society, the Maker's World, the Superstate, or Prosperity Unlimted.
2. Regression Futures. Regression futures could result from growth of dissatisfactions, worsening economic conditions, deepening value cleavages which could lead first to something close to a breakdown in the traditional systems, perhaps followed by the

rise of an authoritarian form of rule over a withdrawn people. Names for this future could include the Survival Society, Depression, Collapse, Repression, Rule of Iron, and the Lost Society.

3. Transformational Futures. These futures start off the same way as Regression Futures, but the crisis, instead of leading to abyssal depression, produces a transformation of priorities, leading to the rise of a new life way (the Mover) and to a successful person-oriented, ecologically-aware, low-growth economic system and a populace geared more to inner satisfactions than to outer plenty. Possible names for this outcome are the Self-Actualizing Society, Unfolding, Voluntary Simplicity, Contented Frugality, the Synergistic State, and the Mover's World.

Tables II, III, and IV, following, show life way profiles and critical value shifts that might accompany these kinds of futures. It is obvious that each class of future has many variants.

Which Way?

The pay-off question, of course, is which way will the society go? Recognizing that conjecture is hazardous and any analysis highly incomplete, we suggest that answers lie in the resolution to four key questions:

1. Can the Preserver and Maker life ways revivify themselves and regain the confidence of Americans and the rest of the world?
2. If not, what life ways are likely to expand at the expense of declining numbers of Preservers and Makers?
3. Under the circumstances of basic value transformation, which life ways are most likely to be heard--that is, which life ways are most likely to originate the operational concepts of future societies?
4. What kind of ideas and insights--no matter where they originate--are most likely to prove the ideas whose time has come?

One scenario in response to these questions is outlined in the following pages.

1. Can the present profile be sustained? There are some--notably Herman Kahn--who answer affirmatively. There are more who answer "no." Our answer is also "no," not because we think the doom-sayers are right and the happy-dust boys are wrong, but (1) because it seems to us that the emphasis upon Preserverism and Makerism no longer affords sufficient latitude in a values sense for the U.S. of tomorrow and (2) because it seems doubtful in an economic sense that weakened groups of Makers and Preservers constituting only 50%-60% of the adult population can "support"

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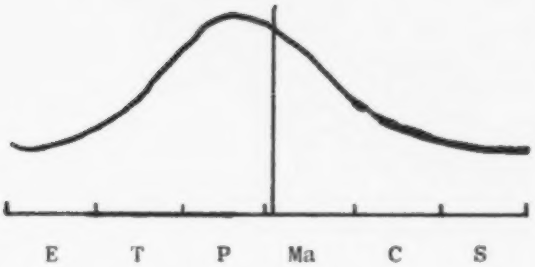
Table II

CONVENTIONAL FUTURES

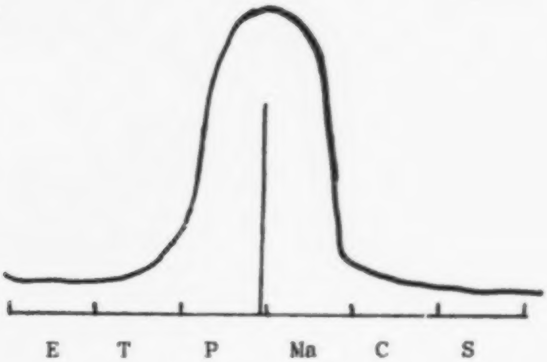
Definition

These futures assume essentially linear extension of the present. Societal evolution is marked by incremental rather than step-function change. The direction of change is "progressive" rather than "regressive." Problems are faced and solved in traditional ways. It turns out that current fears concerning resource and food shortages, pollution, alienation, and system dysfunction are far overstated. As in the past, technology is able to hold in check the negative side-effects of industrialization.

The national life way profile under these conditions would accentuate traditional cultural values.



Today's Profile



Conventional Profile

Value Changes *

1. **Life Goals**	
Personal accomplishment	↑ ↑
Maintain traditions	↑
Prosperous life	↑

2. **Source of Meaning**	
Possessions	↑ ↑
Work	↑ ↑
Fame, status	↑

---

* Up-pointing arrows indicate an increase over today's level of emphasis. Double arrows show a large increase and single arrows a lesser increase.

(Continued) Table II

3. Source of Truth			
Empiricism	↑		↑
Rationalism		↑	

4. Psychological Need			
Mastery	↑		↑
Achievement	↑		↑
Self-fulfillment		↑	

5. Belief System			
Behaviorism	↑		↑
Neo-Freudianism		↑	

6. Morality Pattern			
Social contract	↑		↑
Duty		↑	
Deference to authority			↑

7. Time Orientation			
Past		↑	
Future		↑	

8. Uses of Knowledge			
Control over events	↑		↑
Control over people	↑		↑
Prestige		↑	

9. Uses of Money			
Possessions	↑		↑
Recreation		↑	

10. Uses of Goods			
Show	↑		↑
Comfort, pleasure	↑		↑

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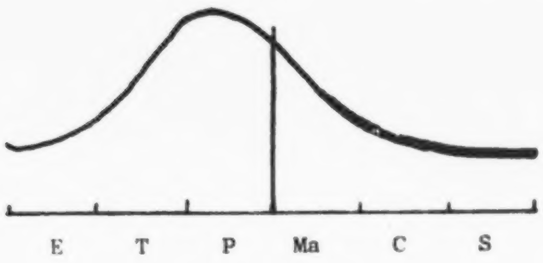
Table III

REGRESSIVE FUTURES

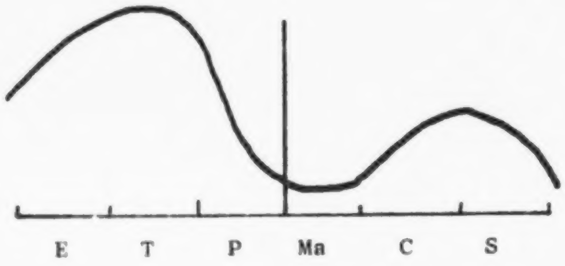
Definition

Regressive futures are those that postulate a throw-back to conditions violently unfavorable to "progress" as broadly defined by the Western democratic tradition. Two major sorts of regressive futures can be identified: (1) deep failure of the free enterprise system (to the point of collapse) and (2) some form of authoritarian society with accompanying elimination of free enterprise. In both cases survival values would dominate.

National life way profiles would emphasize the Escaper-Taker end of the spectrum, as suggested below.



Today's Profile



Regression Profile

Value Changes

1. Life Goals
   - Prosperous life ↑ ↑
   - Family security ↑ ↑
   - Freedom ↑
2. Source of Meaning
   - Power ↑ ↑
   - Money ↑ ↑
   - Possessions ↑ ↑
   - Family ↑
3. Source of Truth
   - Authority ↑ ↑
   - Rationalism ↑
   - Revelation ↑
4. Psychological Need
   - Survival ↑ ↑
   - Security ↑ ↑
   - Acceptance ↑

(Continued)

(Continued) Table III

5. Belief System
   - Fundamentalism ↑ ↑
   - Behaviorism ↑

6. Morality Pattern
   - Deference to authority ↑ ↑
   - Eye-for-an-eye ↑ ↑
   - Duty ↑

7. Time Orientation
   - Emphasis on present ↑ ↑

8. Uses of Knowledge
   - Beat the system ↑ ↑
   - Control over destiny ↑ ↑

9. Uses of Money
   - Influence/power ↑ ↑
   - Sustenance ↑ ↑

10. Uses of Goods
    - Utility ↑ ↑
    - Profit ↑

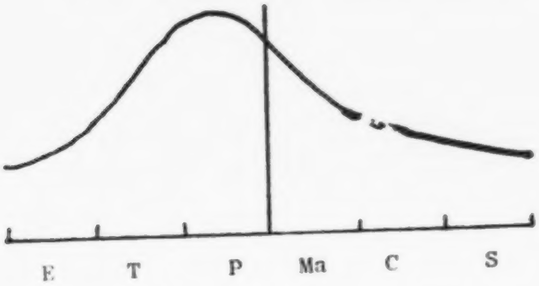
Table IV

TRANSFORMATIONAL FUTURES

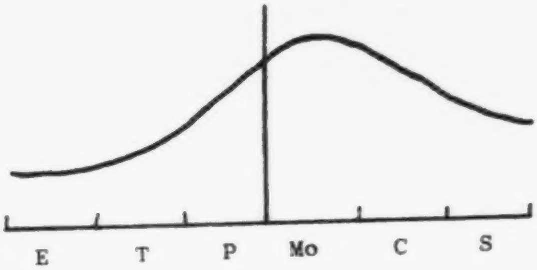
Definition

Transformational futures are characterized by fundamental shifts in values away from conventional industrial views toward more person-centered, inner-directed, ecologically-aware, globally-oriented concerns. These futures come into being because the side effects of the present system require a no-economic-growth philosophy and greater concern for the individual's well-being but with explicit consideration of the collective interest.

A new life way--the Mover--would come into being as the new leadership pattern. More open than Makers, Movers could lead by example and persuasion, thus permitting a flatter national profile than has existed in the past. The Seeker life way would have more influence than ever before.



Today's Profile



Transformational Profile

1. Life Goals
   - Changed social system ↑ ↑
   - Inner harmony ↑ ↑
   - Peaceful world ↑ ↑
   - Equality ↑
2. Source of Meaning
   - Inner self ↑ ↑
   - Esthetics ↑ ↑
   - People ↑ ↑
3. Source of Truth
   - Intuition ↑ ↑
4. Psychological Need
   - Unfolding ↑ ↑
   - Self-fulfillment ↑ ↑
   - Acceptance ↑
5. Belief System
   - Transcendentalism ↑ ↑
   - Immanentism ↑
   - Existentialism ↑

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(Continued)

(Continued)

Table IV

6 Morality Pattern

Universalistic ethics ↑ ↑

Social contract ↑

7. Time Orientation

Present ↑ ↑

Future ↑

8. Uses of Knowledge

Understanding ↑ ↑

Fun ↑

9. Uses of Money

"Experiences" ↑ ↑

Public goods ↑

10. Uses of Goods

Beauty ↑ ↑

Sentiment ↑

Comfort, pleasure ↑

the rest of the nation in the high growth mode to which so many have gladly grown accustomed. The "burden" of Takers is made much of. This is certainly a justifiable complaint if, as we think, Takers are about as numerous today as Makers. Further, it is often pointed out that an increasingly small fraction of the population in coming decades will be called upon to pay the bills of a growing retired group and to keep the young in school for more years. Meanwhile all sorts of social costs continue to rise. Any diminution in Maker motivations or in numbers of Makers could easily crack the established system.

We conclude that, even with good luck and with wise and energetic application of technology to defeat problems of pollution, resources, over population, etc., the prospect of an unchanged national profile of life ways in the U.S. over the coming decade is, at best, marginal.

2. What life ways might expand? Each life way seems to have its unique "change paths" depending on whether or not the individual feels he is being successful in his life endeavor. Figure 5 shows these change paths.

It is clear that, in aggregate, more paths lead to the Seeker, Changer, and Maker life ways than to others. These are the life ways most concerned with change, whether incremental or more dramatic. Perhaps the most significant pathways for the society of 1975 are the success/palls and the failure/not accepted routes of Makers and Preservers.

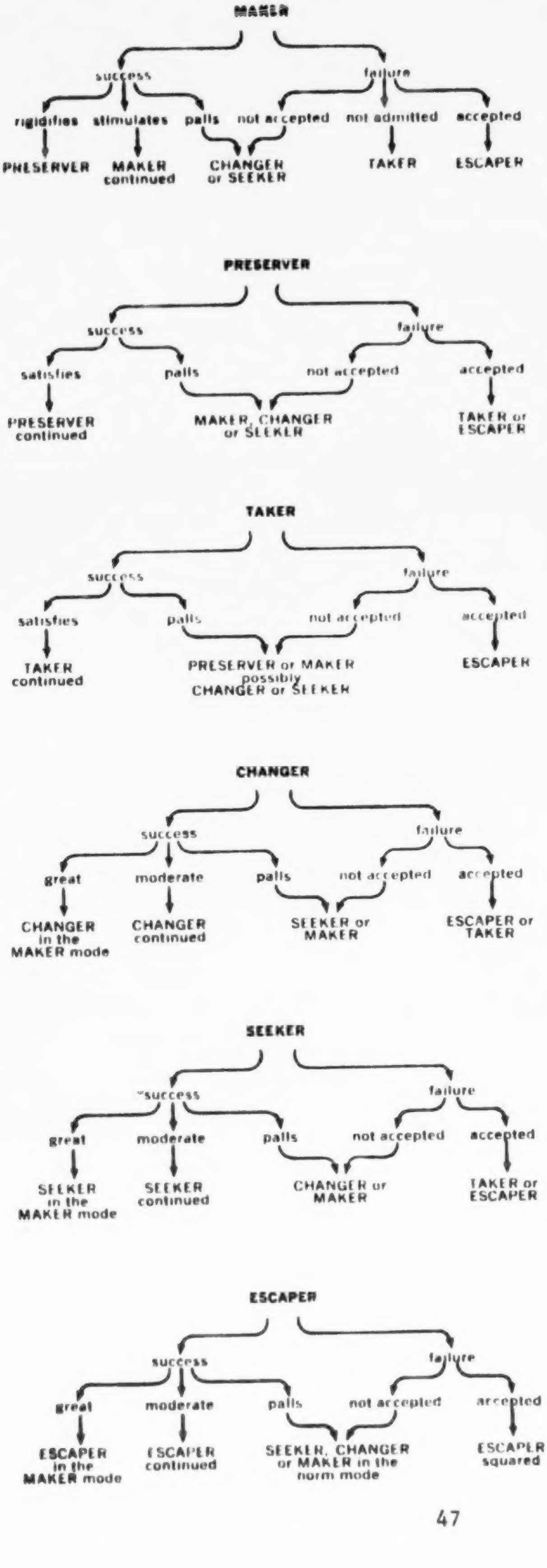
MAKER
success
failure
rigidifies
stimulates
palls
not accepted
not admitted
accepted
PRESERVER
MAKER continued
CHANGER or SEEKER
TAKER
ESCAPER
PRESERVER
success
failure
satisfies
palls
not accepted
accepted
PRESERVER continued
MAKER, CHANGER or SEEKER
TAKER or ESCAPER
TAKER
success
failure
satisfies
palls
not accepted
accepted
TAKER continued
PRESERVER or MAKER possibly CHANGER or SEEKER
ESCAPER
CHANGER
success
failure
great
moderate
palls
not accepted
accepted
CHANGER in the MAKER mode
CHANGER continued
SEEKER or MAKER
ESCAPER or TAKER
SEEKER
success
failure
great
moderate
palls
not accepted
accepted
SEEKER in the MAKER mode
SEEKER continued
CHANGER or MAKER
TAKER or ESCAPER
ESCAPER
success
failure
great
moderate
palls
not accepted
accepted
ESCAPER in the MAKER mode
ESCAPER continued
SEEKER, CHANGER or MAKER in the norm mode
ESCAPER squared

Figure 5 Change Paths of the Life Ways

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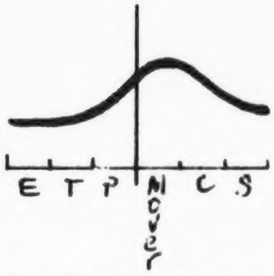
In some basic sense these channels represent individual growth, either through "out growing" a familiar life pattern or through deep recognition that the life pattern is not doing its intended job of bringing satisfaction. People changing life ways for these kinds of reasons may be expected to gather in new insights with high enthusiasm; that they are thoroughly familiar with the system will make them especially effective in making the new insights operational.

The conclusion here is that some substantial fraction of Makers and (to a lesser degree) Preservers are likely to be gravitating toward Seeker and Changer values. Indeed, such a movement seems already to be under way. An intuitive sense of trends suggests that over the next decade perhaps a quarter of today's Preservers will be better defined in Seeker, Changer, and Maker terms and that half of today's Makers will have adopted major elements of the Seeker and Changer. The inference is that the fraction of the population dominantly in the Preserver and Maker modes will have dropped from roughly 55% in the early 1970s to 35-40% by 1985. Numbers of Changers and Seekers, now estimated at 10% and 7% of the population, will double to roughly 20% and 15%, respectively. In brief, Changers and Seekers will rival Preservers and Makers in number.

Easily the most significant result of this massive mixing of Preserver—Maker—Changer—Seeker values is the prospect of the creation of a new life way partaking of all four established patterns but being distinctive by virtue of being "wider"--of being an amalgam responsive to and understanding of many views. This way of life might be called that of the Mover.



Possible 1985

The advent of the Mover life way will influence the national profile profoundly not only by coalescing many of the values of Preservers, Makers, Changers, and Seekers, but by attracting those Escapers and Takers drawn to the inner life. The upshot will be a relatively flat national life way profile that has every chance of offering stability in a fast changing world. It is notably strong in the building modes--those of Makers and Movers--and sufficiently interested in preserving the past not to fly apart from excesses of experimentalism. Such a society should have the economic resources to carry its remaining Escapers and Takers with little trouble. And it should be able to hear its Changers and Seekers without being threatened by them. The profile is notable for the diversity it permits. A lot of people could find their most natural niche in this kind of a society. It should work if Movers have sufficient influence and charisma to achieve the consensus every democracy requires to be successful.

3. Life ways likely to be heard. Assuming the emergence of a Mover leadership pattern compounded of several life ways, the question becomes which of the life way components will dominate--presuming that all will contribute. It seems reasonable that the life way which has not yet

been "given a chance" will at last emerge as the central value theme. It is clear that Preservers and Makers have, throughout the nation's history, had leadership roles. During several periods--notably during Revolutionary days, in the early decades of the 1900s, and again in the 1960s--Changer ideas were prominent and sometimes salient. But Seeker values thus far in U.S. history have never received much official attention, one reason being that there were so very few Seekers until 15 years ago. In a society full of self criticism and emerging awarenesses, under attack by those who continue to see material growth as the prime criterion, and beseiged within and without by demands for help of every sort, the nation's leadership will need a sense of self-reliance and inner assurance. These qualities are the essence of Seekerism. As stated in another paper:[32]

> Seekers search for meaning and solutions beyond the obvious. Unlike Makers and Changers, who in their different ways are centrally concerned with the existing external world, Seekers tend to find greatest challenge and reward in the inner realm. Unlike Takers and Preservers, who wish to halt change, Seekers court the unexplored. Unlike Escapers, they want involvement and aliveness and reality. More than any other life type, the Seeker feels and thinks and acts in terms of ultimates, universals, unities, and the grand scheme of things. He feels himself part of a totality that goes beyond everyday events.
>
> The Seeker has two symbiotic parts. On one hand the essence of the Seeker is the inner process--the immediacy of living, the rise and fall of emotion, the flare of ideas, and (above all) the moments of peak experience. This part of him is in a constant quest for self understanding, for self identity in terms of inner response. The other part of the Seeker craves action. Seekers are far from idlers. Filled with a sense of the significance and power of their life way, confident of its rightness and wisdom, Seekers are often deeply mission-

> oriented people. Energized by an inner source, their actions usually focus on the problems of people rather than on personal affairs. Their activities seem less directed to answers than to processes, less to parts than to wholes, less to the rational than to what feels right. Some, at least, are the realistic dreamers pulled on by a sense of what can be.

Given the threatened chaos that produced the Mover leadership pattern, it seems likely that the Seeker's "realistic dreams" will at last get a societal hearing. It is worth noting, too, that in the mid and latter 1980s many of the gifted "forerunner" youths of the 1960s--large numbers of whom early grasped the Seeker viewpoint--will be coming into positions of major influence. The "purity" of their Seekerism, dovetailed with the practicality of the Maker turned Mover, seems an especially potent combine.

4. Ideas whose time has come. What has been said about the origin of the key concepts of the Mover's society suggests the nature of the ideas whose time will have come. These are the kinds of concepts Jonah Salk associates with Epoch B,[33] that O. W. Markley[34] outlines as the necessary paradigm for the future in The Changing Images of Man, and that students of humanistic psychology define as being fully human. They espouse what Aldous Huxley,[35] a generation ago, called "the perennial philosophy."

This is not the place to attempt to set forth the complex array of such values, except to say that they will have to be more than conceptual. Pragmatically they will be designed to cope with daily problems in the

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physical world (pollution, famine, resource shortages, etc.), in the economic world (income disparities nationally and internationally, employment, inflation, etc.), and in the human world (meaningful work, discrimination, quality of life, etc.). Leadership by Movers, if it is to be successful, will have to teach the practical man to dream and the dreamer to turn to the task at hand.

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SECTION III

REVIEW OF FUTURES LITERATURE

In an attempt to minimize our own biases in the generation of plausible alternative futures scenarios, we turned to futures literature to aid our development of a broad spectrum of plausible descriptions of the nature of future society. This section presents our systematic review of sixteen different works from the futures literature. These were selected, not simply to reflect prevailing concepts of the future in good standing at present, but also to represent the widest plausible spectrum of future possibility.

Each review was structured around topical categories to insure that they would be both comprehensive and comparable. In some instances, however, the literature being reviewed did not lend itself readily to this format and consequently a category is sometimes omitted from a particular review. A further discussion of the rationale for reviewing the literature, the manner of selection, and the means of utilization can be found in the preceding discussion of "Alternative Futures Methodology" (Section I of Working Papers).

It should be noted that these reviews represent our interpretation of a representative sample of futures literature and may not precisely reflect the views of the authors of these works. Finally, no rank-ordering of importance or probability is implied by the sequence in which these are presented.

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REVIEW OF FUTURES LITERATURE

#1

Source: Kahn, H. and Bruce-Briggs, B., Things to Come: Thinking About the 70's and 80's (MacMilland Co., New York, 1972).

Time Frame: 1975-1985

Underlying Assumptions

- The long term multi-fold trend of the industrial era will continue during the period subject only to relatively minor modifications.
- Individual wealth and levels of consumption will be much higher than they are today (1975).
- Environmental concern will increase but will not impose any effective constraint on the use or development of technology until 1985.
- Availability of fuels and raw materials (including food and natural fibers) is assumed and therefore resource exhaustion or disruption of trade patterns are not considered limiting factors.

Critical Issues

- Preventing effective political power being gained by forces capable of disrupting the long term multi-fold trend.
- Preventing the outbreak of nuclear war.
- Possible collapse of morale and morals in the developed countries.

Key Events

While not listing any key events per se, the authors do suggest two related possibilities that they feel would have significant results:

- The occurrence of a "Vietnam Debacle"--i.e., the downfall of the Saigon government within too short a period after American withdrawal--that would completely divide the American people over "who lost Vietnam?" This produces a resurrection of McCarthyism.

- After a period of bitter division and, perhaps, violence a "dynamic and competent responsible (or humanistic) center reestablishes itself." This is seen as something of a coup d'etat through which a responsible law and order leadership--expressing traditional patriotic and moral values and committed to conservative views--assumes control: it is something like a "friendly fascism."

World Economy

A truly international, interdependent economy develops through the agency of the multinational corporations. The pace of development increases. As standards of consumption rise, nationalism and ideologies play a lesser role and the gaps between living standards in "developed" and "lesser-developed" nations are unlikely to be politicized and disruptive. Oil in particular and raw material in general are freely transferred and do not become weapons of international politics.

United States Economy

The United States remains enormously rich and productive. However, its position tends to decline relative to Japan, Eastern Europe, and the dynamic regions of Latin America, Southeast Asia, and Southern Europe. In the context of a world economy it is the multinational corporation of United States origin rather than the United States *per se* that is the engine of economic growth and power.

Within America the major employers continue to be the service industries and government. Although industry (and agriculture) underlie and support the tertiary and quaternary sectors, they do not dominate politically.

United States Politics

In the context of the authors' three scenarios for the United States--Neutral, Modestly Optimistic, and Modestly Pessimistic--the political

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scene remains much the same. Save for the rise, in the South, of an effective and permanent Wallaceite third party as a feature of the Modestly Pessimistic view, there are no significant political changes.

Although the political machinery and system do not enjoy any great favor among the populace at large, they retain their legitimacy and relative effectiveness.

In both the Neutral and Modestly Optimistic futures environmental issues (pollution control) are politically significant. It is assumed in both that moderate and "sensible" policies which do not interfere with private property rights function to the satisfaction of all but eco-freaks. In the Modestly Pessimistic future (in which unemployment averages 5 percent) there are disputes centered around the relationship between pollution, production, and power.

Foreign Relations

Kahn and Bruce-Briggs assign enormous importance to foreign relations in a multi-polar world in which the nation-state remains the major actor even though the economic system in which it operates is increasingly an integrated world system.

Nuclear weapons proliferation poses the greatest danger. An equal danger is that through some "loss of nerve" the United States will become isolationist and withdraw from its responsibilities. The authors are preoccupied (they wrote before the 1972 Geneva Agreement) with the effects both on domestic and world politics of an American failure to achieve some form of "victory" in Vietnam.

In all their futures the authors see some loss of United States public interest in the outside world and a concurrent loss of United States prestige and ability to influence world events. However, the activities of the multinational corporations serve to mitigate the potentially dangerous effects of such a development.

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Society and Culture

In all three futures there exists a "mosaic culture." In all but the Modestly Pessimistic there is considerable tolerance for a wide variety of lifestyles. However, there are no widespread and major deviations from the accepted norms which are: neo-materialistic (achievement-consumption oriented), neo-epicurean (more oriented toward human relations than to advancement and high achievement materially), neo-stoic (the good soldier/civil servant), and neo-gentleman (the high income man of leisure).

Science and Technology

Scientific and technological advances continue throughout the period. However, there is danger both of misuse of science for physically and morally destructive purposes and of a lessening support for science, especially by the upper middle class in developed countries. In the biological sciences there is the greatest chance of socially-indigestible development.

Energy and Resources

Availability of sufficient energy and raw material resources is assumed. Specifically denied is any real possibility that the petroleum producing countries will be able to deny to the European countries or the United States access to oil, or that they would find it either to their economic or political interest to do so.

The Environment

There are no serious environmental questions to be faced until at least 1985. The authors dismiss much of present concern as the agitation of fringe groups who are annoying at best and potentially dangerous at worst.

Under Modestly Pessimistic conditions, such groups provoke fierce and bitter opposition from those interested in stimulating the economy and getting jobs; in the Neutral future, they are quashed in a "back-lash" while "responsible" leadership ensures that no real environmental damage occurs.

Population/Demographics

World population growth will slow markedly. In the industrial countries it may even stop by 1985. Realization of the negative effect of high birthrates on economic growth will cause the decline of growth rates in the developing countries, even in the absence of population planning programs.

Urbanization in developing countries and conurbanization in the industrialized world are seen as favorable and continuing trends. Even the bidonvilles of the underdeveloped countries are seen as dynamic and productive areas preferable to rural stagnation.

Food and Agriculture

There is absolutely no possibility of any mass food shortages during the period. The Green Revolution has solved the problem effectively. The major food and agriculture problem will be food surplus.

REVIEW OF FUTURES LITERATURE

#2

Source: Bell, D., The Coming of Post-Industrial Society (Basic Books, Inc., New York, 1973).

Time Frame: 1975-2000

Underlying Assumptions

- Existing social institutions are making the necessary adjustments to change.
- Continued technological growth is probable and necessary.
- Levels of material consumption can be expected to increase.
- The post-industrial society will need new institutions to direct the economic machinery of extraction and production (in which fewer and fewer people will be employed) so that the product is fairly distributed and human and natural environments protected.
- The environmental problem (externalities) is not insuperable or limiting within the time frame.
- Scarcity of energy or raw material resources is considered a minor problem.

Critical Issues

- Appropriate organization of high technology, highly productive society.
- Continued support for and confidence in science and technology.
- Managing the change from a market-oriented individualist society to a communal society in which public mechanisms are used to allocate goods and services.

Key Events

One of the most interesting aspects of The Coming of Post-Industrial Society, viewed as futures forecasting, is that it eschews description either of specific results or the events leading to them. Basically, it is an optimistic scenario of evolutionary change in which the necessary adjustments are made without catastrophe and with a minimum of sturm und drang.

This is not to say that specific events will not seem catastrophic to those taking part in them. Bell cites the furor caused in Massachusetts politics early in this century over the savings bank life insurance proposal authored by Louis Brandeis. As an issue it died with its passage. Bell draws the lesson:

> ...reforms will never be as sweeping in their effects as their proponents hope, and the results will rarely be as damaging and apocalyptic as the opponents fear. Workmen's compensation was an issue that inflamed a generation of radicals and was fought by industry on the ground that it would relieve the workman of "individual responsibility" for his actions; yet who today would deny that industrial safety is a legitimate cost of factory operations?

Bell's post-industrial society develops without desperate or dramatic struggles and faces no stark survival choices. It is a responsible society tending toward communality and away from an individualistic property-based system. The likely result is that environmental management in the public interest will become progressively easier as the period goes on. Hence, the planning of pesticide policy, as part of integrated environmental management, should be facilitated.

World Economy

Bell pays little attention to international trade or economics but does urge that U.S. productivity must be improved if the United States is to retain a position in international trade. There is no mention of the importance of U.S. agriculture in foreign trade or of U.S. reliance on foreign sources of fuels and other raw materials.

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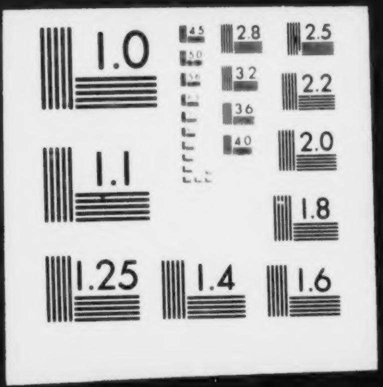
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U.S. Economy

Leading the rest of the world into the post-industrial age, the United States remains highly productive and prosperous with high reliance on new scientific discoveries and technological application. Few people are employed in production, however. Most new occupations are in a highly elaborated service sector which (although Bell does not emphasize the point) are financed out of the production sectors.

U.S. Politics

The form of the political structure is not outlined in any very great detail. Power, however, passes from the hands of legislatures and is increasingly divided between the executive on the one hand and the participative, communal groups on the other.

Decision making is increasingly politicized, both in the economy and the culture. The great political question is posed as follows:

> The simplistic notion that one should be "free" to follow one's individual impulse comes into conflict with the increasing pressure for communities to regulate the material conditions of life--including the development of recreation, of access to beaches or wild lands, or the multifarious ways in which the increasing interdependence of life forces each individual to subordinate his desires because they have an adverse effect on others. Politically, there may be a communal society coming into being; but is there a communal ethic? And is one possible? (p. 483)

Foreign Relations

As the imperatives of post-industrial society become operative, all the now industrialized nations come to resemble one another far more than they differ. The ideological quarrel between "capitalism" and "socialism" disappears in the bureaucratization of both.

The multinational corporations increasingly bind the whole world into an interdependent economic unit. The currently developed nations serve as their headquarters and specialize in knowledge creation and knowledge processing, while the functions of production of the standardized sort are carried out within the lesser developed countries.

The international landscape as Bell views it over the next 25 years is essentially a peaceful one. Citing Paul Samuelson and Arnold Toynbee, he cannot believe that the societies to which the production activities are assigned will long submit passively to a situation in which the profits and dividends flow back to "headquarters" to support a rentier population. However, the inevitable struggle over division of wealth he sees as "a problem for the twenty-first century."

Society and Cultural

The next 25 years see great social and cultural confusion in the United States. The post-industrial transformation responds to the following set of conditions:

> For most of human history, reality was nature, and in poetry and imagination men sought to relate the self to the natural world. Then reality became technics, tools and things made by men yet given an independent existence outside himself, the reified world. Now reality is primarily the social world--neither nature nor things, only men--experienced through the reciprocal consciousness of self and others. Society itself becomes a web of consciousness, a form of imagination to be realized as a social construction. Inevitably, a post-industrial society gives rise to a new Utopianism, both engineering and psychedelic. Men can be remade or released, their behavior conditioned or their consciousness altered. The constraints of the past vanish with the end of nature and things.

Bell leaves the resulting social and cultural forms to the reader's imagination. However, much of his discussion allows a conclusion that, although the institutions of the post-industrial society will be very highly structured and the behavior of people within them will be closely constrained and controlled by the institutions, the whole sphere of noneconomic personal relationships will be marked by the greatest freedom and diversity.

Science and Technology

Science is increasingly bureaucratized and managed so as to meet communally expressed goals of society. More and more people are employed as scientists and technicians. However, the attention is given more to the management of externalities, the recycling of wastes, and the increase of productivity than to the development of new products. Thus, even though startling new processes may be expected, the type of future-shock-producing innovations in daily life predicted by Alvin Toffler are unlikely.

Energy and Resources

There is assumed to be sufficient energy and raw materials available to provide for a high level of consumption within the already developed countries and a rise in standards worldwide.

The Environment

One of the clearest and most pervasive conclusions of this book is that the post-industrial future is one in which environmental protection is dominant. At least private gain at the expense of the environment, without careful reckoning and payment of the costs of externals, will be a thing of the past. There is an assumption that the public will demand protection of the environment. There is relatively little consideration of whether the post-industrial society (dependent as it is on the continuation of the industrial process) might, in the short run, opt for environmentally destructive practices in order to maintain or increase the level of material goods consumption.

Population/Demographics

From logistic curve analysis Bell argues that human societies, in common with other forms of life, do not over long periods increase exponentially. A levelling off period is foreseen, but with a real possibility of some violent aberrations as the sigmoid curve bends.

Food and Agriculture

The ability of the world to feed itself throughout the period is not questioned.

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REVIEW OF FUTURES LITERATURE

#3

Source: Mitchell, A., "Lifeways and Lifestyles," Long Range Planning Service Report No. 500, SRI (1973).

Time Frame: 1970-1990

Underlying Assumptions

- There is no major systems collapse; civilization continues.
- Post-industrial society can emerge without revolutionary upheaval.
- The society has the capacity to accept broad-based, collective goals.
- Institutions have an immense adaptive capacity.
- The nation-state will continue as the primary political unit.

Critical Issues

- Speed and ease of transition to the post-industrial society.
- Finding adequate new-value leadership for the post-industrial society.
- Capacity to adapt to shifts in sociocultural values.
- Emergence of new lifeways and lifestyles.

Key Events

- A "severe lifeway bi-modalism, pitting the forces of change against the forces of the status quo."
- Emergence of the post-industrial society.
- Significant shift in American values (privatism to collectivism).
- End of the cold war.
- Zero population growth by 1990.
- GNP reaches an all-time high.

World Economy

There are few restrictions on imports and high levels of trade. The spread of U.S. economic imperialism is diminished by foreign regulations. Greater regulation of business trends to level the rate of economic growth. Business priorities switch to control pollution, conservation, and the development of a new social leadership.

Extensive programs of social, technical, and economic aid are initiated to assist the underdeveloped nations. The prospect of overcoming population and hunger problems is improved, but the outcome uncertain.

U.S. Economy

General prosperity characterizes the U.S. economy through 1990. The most major economic dislocations result from the United States deemphasizing its global military posture. The economy is otherwise mixed, experiencing increasing "swings" and "little catastrophies." GNP reaches an all-time high, yet low economic growth begins to be accepted as a satisfactory societal condition. A new era of industrial regulation begins.

Significant value changes in the 1980s mark the beginning of the shift to the post-industrial society. In the highly mixed economy a trend begins toward democratic socialism, although a simultaneous tendency toward "reprivatization" signals a margin of popular reluctance. The economy demonstrates reasonable success in adapting to the shift in industrial production from private goods to public goods.

U.S. Politics

Throughout the seventies, the U.S. maintains the two-party political system which affords a reasonable degree of representative democracy to the citizenry. By the end of this decade, though, the old methods of problem solving have proved inadequate to deal with the confusing complexity of external problems (resource depletion) and internal problems (rising expectations, alienations), and the 1980s open with general political chaos. The political situation is marked by "authoritarian surges admixed with dependence on individual initiative."

As the country begins to adjust to the arrival of the post-industrial state and adopt new values accordingly, there emerges new governing criteria based more on collective interests and not so much on private aims. Government assumes an expanded social role, and meets major safety and security needs. A major new program of income redistribution is adopted. The youth of the sixties have come of age in the eighties and provide powerful new-age political leadership.

Foreign Relations

The U.S. abdication of power in international politics and the abandonment of overseas military bases signal a general decline in the cold war. Traditional alliances tend to disintegrate in the wake of widespread support for international bodies. There is a rise in unrest in small and developing countries, but in general there is evidence of an improved international stability.

Society and Culture

This scenario describes a 15 to 20 year switchover in the United States from the industrial system to the post-industrial system. "Key adjectives used to describe the kind of post-industrialism anticipated are: collectively oriented, inner-directed, focused on individual growth, person-centered, internationally sensitive, ecologically aware, socially responsive, and accepting of low economic growth" (p. 32). The acquisition of these new values will be pervasive, influencing business and government as well as social roles and personal behavior.

During the transition there will be considerable social disruption including societal anger, disillusionment, noncooperation, and chaos, but social harmony will eventually prevail.

Science and Technology

In the 1970s the general emphasis of scientific and technological endeavor shifts from consumer, industrial and military applications toward a significant and organized attack upon symptoms and causes of ecological disruption. By the end of the 1980s a major, holistic attack upon the problems of human ecology is underway, and the efforts of science are centered primarily on responses to social concerns.

Throughout the period, the advance of science and technology continues to free greater numbers of persons from the work force.

Energy and Resources

The continued rapid rate of world resource depletion represents a major problem to U.S. society. With the emergence of a post-industrial era, the adoption of new-age values and psychologically mature insights helps to reformulate the energy/resource problem into a single social vision which represents a composite of all social problems--ecology, economics, employment, etc. The approach to solving the problem is based on the willingness to place the collective good ahead of private interests.

The Environment

Major improvements result through scientific and technolgical effort directed toward social goals; however, some industries are adversely affected and the public is inconvenienced. There is strong support for ecology programs in all sectors of society, government, public and business; a new ecological awareness is pervasive. Mitchell believes that this support will discourage the unrestrained growth ethic, but GNP will nonetheless be maintained at unprecedented levels.

Population/Demographics

Population growth proves the moderate assumptions made in the early 1970s. Significant growth in the youth group (aged 15-24 years) provides continued impetus for social change. However, the youth group will shrink relative to the population aged 25-44 years and those over 55.

By the 1980s the annual population growth rate decreases further; population distribution is characterized by a continuation of urbanization and urban sprawl, although a strong trend toward exurban and rural living emerges by 1990--which is the year that zero growth occurs.

Food and Agriculture

Mitchell notes only that extensive aid to underdeveoped nations will help alleviate immediate hunger, but restraints on pesticides and fertilizer will have negative impact over time.

REVIEW OF FUTURES LITERATURE

#4

Source: Heller, A., ed., The California Tomorrow Plan (William Kaufman, Inc., Los Altos, California, 1971).

Time Frame: 1970-2000

Underlying Assumptions

- The world population explosion will not diminish significantly.
- Food and energy scarcities will create serious dislocations internationally, and to a lesser degree in the United States.
- By 1999, the population of California will have increased by at least 10 million over the 1970 population of 20 million.
- The United States economy will remain essentially "mixed"; the government's role in economic planning and control will change.
- The nation will remain as a federation of states under the Constitution; new forms of government will emerge at lower levels.
- Society will remain very heavily dependent upon technological development.
- Society will adopt some new "post-industrial" values: (1) personal income will not be so closely linked to personal productivity; (2) leisure activities and avocational pursuits will tend to assume an importance approaching that of traditional career jobs; and (3) education will become an even larger concern than it is today.
- Self-interest will continue to be the basic source of individual motivation.
- The government (State of California) is capable of rapid and radical changes in structure and governing ideology.
- Some unknown force will motivate people to forego short term, local, immediate priorities of gain, pleasure, profit--and adopt the long term, enlightened, comprehensive, holistic planning-type ethic typified by California Two.

Critical Issues/Key Events

The California Tomorrow Plan presents essentially one critical issue: is California to maintain its traditional means of coping with problems on a piecemeal basis, or can significant changes in government structure, public and private spending, social organization, consciousness and life-style be effected within the state so that problem solving will be based on the recognition of relationships between problems and the identification of problem-solution sets.

There are nine key events that must occur to bring about this alternative approach to problem solving:

- Emergency action to protect endangered state land.
- Adoption of central driving policies for the state.
- Establishment of a single state planning and budgeting agency.
- Establishment of regional governments.
- Establishment of community councils.
- Adoption of new election laws.
- Utilization of modern fact-gathering techniques by state policy makers.
- Urging federal action to encourage strong state planning/budgeting operations.
- Broad public commitment to compassionate, systematic, comprehensive planning.

World Economy

No international economic impacts are stated or even directly implied within the context of the California One and California Two scenarios. However, the following aspects of the scenarios could conceivably have international economic implications.

- Environmental limitations on goods production.
- Unrestrained economic growth versus development under growth limitations.

- Market opportunities in state conservation and development programs.
- Major shifts in levels of disposable income.

United States Economy

The California Tomorrow Plan contains no projects for the whole United States economy but explicitly assumes that the national economy will remain essentially "mixed." The only portions of the California Plan that are relevant to United States economics are the impact of federal economic aid and the degree to which the state model can influence national economic planning.

In California One, policies that encourage unrestrained economic growth result in increased urbanization and environmental destruction. Government contributes to this process its subsidizing of many enterprises, and by only sporadically enforcing control regulations. Although economic growth provides jobs, the job market is highly unpredictable. Tax policies of California One tend to encourage wasteful patterns of growth, and with few exceptions, do not serve as positive instruments of government. The state budget continues to reflect the separate programs of single-purpose agencies. The state budgeting and accounting process is not geared to making full assessments of the costs and benefits of various planning alternatives. The costs of doing business and governing increase to overwhelming proportions.

Instead of encouraging unrestrained economic growth, California Two encourages economic development within environmental limits clearly defined in the comprehensive California State Plan, which specifies long term and short term state goals, policies, programs and budgets. Specific features of the economic environment of California Two include:

- A guaranteed minimum income ($6,000 for a family of four) tied to a work incentive provision.
- A state economic advisory service to guide both public and private economic development policy.

- The adoption of long term, multibillion dollar conservation and development programs by state and regional governments.
- Federal funding assistance from a federal conservation and development bank.
- An adequate and steady supply of jobs.
- The adoption of an overall economic policy, "To provide economic strength...."
- Economic planning and funding not only at the state level, but within strong regional governments as well (regional plans and budgets must be within the guidelines of the state plan and budget).
- Partly because of the environmental constraints on manufacturing, high taxes and limited disposable income.

California Two demonstrates that economic sufficiency can be maintained without destroying the environment in the process. Its success is sufficiently encouraging to the federal government that all states are required to apply for loans and other forms of assistance on the basis of comprehensive regional planning.

United States Politics

The two California futures described are relevant in the national context only to the degree that they either encourage or necessitate the adoption of similar systems in other states, or that they cause significant restructuring of the federal or other state governments. The two futures unfold primarily as a result of two distinctly different forms of state and local government. In fact, The California Tomorrow Plan is essentially an outline of alternative forms of government, with examples of physical, social, and environmental impacts included as a means of illustrating the effectiveness of each form of government.

In California One, problems of social and environmental disruptions are met piecemeal as they become visible and as the public becomes alarmed about them. No integrated framework exists for making public policy. There are no central, clearly stated public policies or goals; there is no shared vision of what California could become. The structure of state and local government in California One remains essentially as in the early 1970s. Jurisdictions continue to overlap and agencies work at cross-purposes without any explicit system of priorities, in spite of efforts to group related functions into major agencies. Government grows enormously as new bureaucracies are added in response to emerging problems. Elections are dominated by large contributors, and this pattern results in overwhelming political power for major economic interests. Policymaking boards are often appointed and immune to effective citizen control.

Foreign Relations

The California Tomorrow Plan does not specifically address any issue of foreign relations. Because the projected futures deal solely with the single state of California, any international implications are limited. Nonetheless, because California does rank as one of the world's foremost economies in size and strength, any significant political or economic realignment within it could result in policy shifts not only in other states but also in United States foreign relations policy and international marketing.

Society and Culture

The sociocultural environment that is projected in California One results from adherence to present methods of problem-solving and policymaking. In California One, the state's problems relative to employment, education, health, recreation, discrimination, crime and civil disorder are intensified and compounded. Numerous examples of specific social ills are presented. Although extensive revision of existing programs does improve the quality of social service, the system proves incapable of responding to and solving the direct causes of social problems.

The foremost goal of California Two is essentially a social goal, "To provide for personal fulfillment within an amenable environment." In California Two a set of California Standards are adapted which establish statewide minimum standards for environmental quality and amenity, and for public facilities and services. The standards include requirements for: regional and community health care facilities; educational, recreational, and cultural facilities and programs; employment centers; correctional facilities; community centers; and government buildings and offices.

Most of the jobs in California Two are in the service industries. Long term, billion dollar state and regional building programs respond to such social economic needs as housing, regional transportation, waste disposal, urban renewal, and new-town construction. The planning process in California Two is restructured so as to be more responsive to local and regional problems. There are still widespread social problems, but regionally developed and administered programs have replaced the less responsive programs of the past.

Science and Technology

Despite present concerns about the destructive aspects of technology, The California Tomorrow Plan specifically assumes that our society will remain very heavily dependent upon technological development in whatever future scenario unfolds. As a whole, however, The California Tomorrow Plan speculates very little about the degree of adoption or dependence on science and new technology, or about their impact on the structure of society.

Energy and Resources

California One has no single underlying program or policy to manage energy and resource consumption. Thus, the behavior of private organizations, government agencies, and individuals is tied to short term economic incentives. This approach encourages both wasteful consumption and environmental degradation. Growth in energy demand is virtually unchecked. Power blackouts are common in metropolitan areas. The costs of energy and material resources escalate drastically. Nuclear power plants are built. The rampant exploitation of resources and materials results in widespread and irreversible environmental damage.

In California Two, a central driving policy is designed to conserve the state's resource base over the long term by establishing new patterns of energy consumption. This program ends the profligate use of resources and encourages recycling. Economic incentives as well as regulations are used to help eliminate damaging patterns of energy consumption (e.g., electricity consumption tax, energy-frugal building requirements, oil depletion tax, graduated tax on high-powered automobiles), of land use (e.g., property tax according to state zone class, elimination of capital gains benefit on land speculation), and of mineral resource depletion (e.g., a building materials tax). Recycling is encouraged through such means as a packaging tax, price supports for waste reclamation, and an automobile tax sufficient to pay for eventual recycling. In addition, changes in policy encourage the reuse and multiple use of already existing structures.

The Environment

In California One, the proliferation of agencies and regulatory commissions--often working at cross-purposes--does little to effectively manage and protect the state's environment. No single agency has sufficient funds or authority to provide adequate environmental management.

A wide array of environmental degradations continues beyond the limits of existing regulation. Land-use policy is determined at the local level. Tax incentives encourage the urbanization of agricultural land. Thermal pollution of waterways results from the use of nuclear reactors. Nuclear waste storage becomes a critical environmental issue. Short-sighted policy on water use encourages housing developments and water pollution, and destroys the Delta and Suisun March. Many endangered species become extinct as their wild habitats are destroyed. The beneficial impact on air quality from automobile emmission devices is offset by the increased number of vehicles and inadequate controls over major stationary sources. Legislation is inadequate to prevent the increase of noise pollution and solid waste.

Within the framework of the California Two government, considerable progress is made toward reversing environmental ills and preserving a desirable environment for future generations. The policy to eliminate damaging distribution of population establishes a new framework for settlement. This policy includes: a state zoning plan, a state public utility infrastructure, and the adoption of California Standards for environmental quality.

The state zoning plan is an expression through regulatory mapping, of how demands for urban expansion are to be reconciled with demands for the maintenance of environmental quality. The state infrastructure plan which locates sites and corridors for transportation and utilities is based on determinations about the state's economic future and patterns of employment that do not jeopardize the levels of environmental quality specified in the California State Plan. The California Standards include detailed statewide minimum requirements for air quality, water quality, pesticides, open space, recreational facilities, and noise. These standards are strongly enforced, with violators subject to substantial penalties. The state population policy, as already noted, aims toward a leveling of total population growth, limiting "in-migration" from other states.

Many regions produce much of their own water through recycling, desalination, and the tapping of underground supplies. Efficient, economical, pollution-free waste facilities can handle all solid wastes through programs of direct reuse and recycling.

Population/Demographics

In California One, there are no effective checks on population distribution or "in-migration" from other states. As a result, a growing portion of open space and agricultural land is threatened. All the other problems attributable to rapid population growth are manifest: housing shortages, inadequate social services, urbanization, and environmental degradation.

In California Two, two policies are adopted to deal with such problems. The first is focussed on growth. By 1975, the state is assumed to have reached zero population growth, so that by 1999, population will have leveled at 30 million; programs to control "in-migration" are enacted. The state adopts various incentives for a lower population (e.g., tax exemptions for small families, expanded birth control information and services). The second policy deals with population distribution. It calls for a state zoning plan and a state utility/arterial infrastructure to guide settlement and the growth of new cities. The State Planning Council researches optimum population levels for the regions. New cities absorb some of California's population increase through 1999, but most people have been accommodated in existing urban areas. Rural assistance programs have encouraged people to stay on the land.

The basis for the political/government system in California Two is the State Planning Council which is responsible for the preparation of the California State Plan. The Legislature is responsible for adopting the Plan.

The State Planning Council systematically identifies the underlying causes of disruption in the state, and four central driving policies are established to deal with the causes. These four policies are to:

(1) provide political strength, (2) provide economic strength, (3) guide settlement, and (4) guide resource use. These policies operate in all areas of concern, and they form a common problem-solution framework for developing and coordinating all state programs and policies. Ten multi-purpose regional governments are formed in California, each with its own elected legislative body and regional executive branch. The regional governments prepare and carry out comprehensive regional plans and budgets. Counties are established as municipalities, and community councils are elected at the municipal level. Local government operates within guidelines established by state and regional government.

Various provisions are enacted to prevent elections from being dominated by special interests, and state regulatory agencies are reformed in accordance with the state's central driving policies.

Food and Agriculture

In California One, unchecked urbanization causes the agricultural character of many regions to disappear entirely. New lands are irrigated to replace land lost to urbanization or ruined by excessive salt buildups, but these lands require expensive soil conditioning treatments. Food produced on this new land is of inferior quality. In addition, crop damage from air pollution is extensive. Food prices continue to rise. California's salmon and steelhead fisheries are destroyed by channeling, damming, and siltation of north coast rivers. Federal food stamps and commodity programs continue, but many people, particularly in rural areas, are undernourished. Malnutrition remains a part of California life despite various state and federal programs.

In California Two, a state zoning plan is adopted to protect agricultural land. Cooperatives are established in the agricultural zones and "family farms" are encouraged on so-called "excess lands" of the federally irrigated valleys. Minimum standards for surface water in agricultural zones become progressively more strict.

REVIEW OF FUTURES LITERATURE

#5

Source: Drucker, P., The Age of Discontinuity: Guidelines to Our Changing Society (Harper & Row, New York, 1968).

Time Frame: 1968-2000

Underlying Assumptions

- The long term multi-fold trend of the industrial age is in the process of being broken and for the remainder of the century, familiar institutions will change radically and with shocking speed.
- The world will then increasingly unite into an economic whole in which the multinational corporation will play the major role but unless there is a more equitable distribution of wealth, international relations will assume the lineaments of class war.
- Individualist, classical liberal theory contradicts the reality of organized power concentration and will become increasingly dysfunctional.
- Both political and economic power will increasingly reside in the organized knowledge sector.

Critical Issues

- Discovering ways of stimulating innovativeness within large economic, political, and educational institutions.
- Organization of appropriate governance mechanisms for an internationalized economy.
- Increasing the productivity of the world's poorer nations.
- Finding means for preserving individual freedom in a world of necessarily large, tightly structured, and interdependent organizations.
- Restructuring education.

Key Events

- Establishment at some unnamed date of an international body that gives legitimacy to the multinational corporations.
- Establishment of a government policy of worldwide reprivatization of all but basic police and defense functions of government.

World Economy

The world economy will continue to grow unless interrupted by international class war resulting from failure to increase the productivity of poor nations.

Although development policies pursued under U.S. guidance by all the underdeveloped world have been very successful in terms of absolute growth, the relative disparity between rich and poor nations has not been overcome. What is needed is techniques of development appropriate to the post-industrial era similar to those which gave birth and nurture to industrial economies in so many nations during the nineteenth and early twentieth centuries and have not been duplicated since.

U.S. Economy

The U.S. economy is already post-industrial. Increasingly, a major U.S. economic advantage is knowledge production. American economic health depends now and will continue to depend on organization and support for the production of new knowledge and its export to other countries.

The other major U.S. economic advantage lies in its superior knowledge of management and organizational techniques. These, applied in and by multinational corporations, will continue to be responsible for the health of the American economy. It will be necessary to employ these skills in the reform and reorganization of both government and education if the economy is to continue to prosper.

Drucker does not discuss environmental constraints, raw materials shortages, or any possibility of reduced growth in production either in

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the U.S. or worldwide. His emphasis is the need to make the organizational and institutional adjustments to the demands of new knowledge and technology.

U.S. Politics

The major, and necessary, development in U.S. politics will be the transfer of primary responsibility for education, social reform and welfare, and almost all other activities save defense to the private sector. Above all, government will not be a "doer." It will, instead, act as a resource for society.

Foreign Relations

Drucker sees no major war or territorial struggles during this period, and the formation of new nation-states is about over. However, there is an equal chance that the less viable entities will consolidate and the more viable portions of inefficient nation-states will split away.

More and more the function of international relations will be to establish appropriate rules for the free play of the private multinational corporations as they develop the "global marketplace" and provide the impetus for development within the poorer countries.

The major danger is that the multinationals will fail (most likely because of interference by governments) and that the present division of the world into rich and poor nations will continue or even become exacerbated. International class war is a possible result.

Society and Culture

Social and cultural change during this period involve two main elements. First is limitation on the power of government to control the pluralist elements in society; second is the creation of an atmosphere within the major institutions of society, particularly its economic institutions, in which individuals can grow and take responsibility for the management and success of the institution.

Somehow, the society must guarantee economic opportunity for the individual, yet avoid trying to protect the current employment of anyone. Policies of job protection discourage efficiency and labor mobility in the enterprise. There is need to combine the Japanese emphasis on continuous training as a responsibility of the enterprise, the German emphasis on industry as distinct from craft worker organization, and the Swedish guarantee of employment and income through worker mobility financed by government.

Drucker finds little evidence that new forms of family organization or other interpersonal relationships will be important. However, since the key to this future is the management of large institutions, it seems that many diverse forms will be equally acceptable provided that they do not detract from the individual's institutional performance.

Science and Technology

An increased rate of highly organized scientific research and discovery in all fields will be typical of the period. The major problem is the establishment of linkages between business management and science, both to direct the effort into areas of economic payoff and to recognize those discoveries that have immediate economic application.

It is expected that agricultural science and technology will make new breakthroughs. Agriculture will become the fastest growing of all world industries in terms of production.

Energy and Resources

Drucker does not discuss energy or resource shortage as such. The key factor is imaginative management that allows for appropriate materials substitution. Once again, the complementary need is for government not to constrain the enterprise with strangling regulation that impedes the adoption of new or substitute materials.

The Environment

There is no explicit discussion of environmental considerations. The presumption is that the combination of science and technology and skilled management will, if government acts only to express society's desires and needs for a protected environment, develop the appropriate ways and means for dealing with such environmental problems as may arise.

Population/Demographics

Population growth is not seen as any particular problem. Excessive growth rates in lesser developed countries will come to an end as a result of expected economic development.

A more significant population problem is posed by the need to develop social institutions that are adapted to the longer productive lives of most of the world's population.

Food and Agriculture

Agriculture will improve its productivity even more rapidly than it has in the past. The main problem in the future will continue to be food surplus rather than food shortage.

The continuing theme here is that the most serious obstacle in the way of achieving such productivity is unwise government policy that restricts the individual enterprise from applying technology to its fullest.

REVIEW OF FUTURES LITERATURE

#6

Source: Gabor, D., The Mature Society (Praeger Publishers, New York, 1972)

Time Frame: 1975-2000 (and beyond)

Underlying Assumptions

- The age of industrial growth is coming to an end.
- Mankind has the knowledge and existing technology to restructure world society on a satisfactory basis, but in the light of history, the major question is whether he has the wisdom to act on it.
- The assumption is that man does develop the wisdom and will, after a period of travail.

Critical Issues

- Reorganization of science to attack the problems of social, rather than technological, innovation as a first priority.
- Elimination of the arms race and war.
- Education of the human race to acceptance of a stable and humane state of affairs.
- Reorganization of the economy to a system in which discount against future growth can no longer be employed.
- Development of new means to classify people and provide for them occupations and activities suitable to their abilities.
- Provision of sufficient amounts of hardship and adversity to allow people to exercise their innate and necessary abilities to strive and overcome.

Key Events

Gabor presents no "key events" as such. However, certain events, such as the formal acceptance of Swedish-style economic planning--especially manpower training--will occur. Another key event will be major educational reform. The traditional universities will be elite meritocracies and new universities will be created for the remainder. In them, both youth and older people involved in career change will take courses that are essentially occupational training.

It is likely that government-controlled programs of population limitation will be instituted (especially in the lesser developed countries) through mass involuntary sterilization or fertility retardation. In the developed countries government will increasingly become an active partner in basic industries, such as railroads, housing, and so forth.

Other possible key events are famines and a Russo-Chinese war.

World Economy

There is little discussion of the world economy. Gabor concentrates on the manner in which various individual national economies have responded or will have to respond to the issues of steady-state post-industrialism.

The author disposes of the question of the lesser developed countries because of the impossibility of distributing already dwindling supplies of raw materials evenly and because the biosphere will not support the load of effluents that would be produced.

United States Economy

The United States economy is already post-industrial in the sense that the majority of workers are no longer in the productive sector. This trend will continue and the application of technology in the service sector, chiefly through increasing use of the computer, will begin to displace more white collar workers. "Stagflation" will continue. More and more "work" will tend to be make-work.

Environmental considerations, raw materials shortages, and lack of satisfactory work roles are increasingly important as the United States (and other industrially advanced countries) move toward a steady-state, non-growth economy.

United States Politics

Gabor does not discuss United States politics specifically. However, he argues that all the industrialized countries will, perforce, follow something like the Swedish model.

Foreign Relations

International relations during this period are tense among the great powers who will continue to compete with one another for military and economic advantage. However, the sense of vulnerability vis-à-vis each other will tend to prevent the outbreak of nuclear/biological/chemical war. The author regards China as the least inhibited of the great powers and therefore posing the greatest threat to world peace.

There is no discussion of relations between the developed and lesser developed countries. There seems to be a conviction that nation-states will pursue relatively independent courses within environmental, technological, and materials constraints.

Society and Culture

The evolution Gabor foresees is toward a society in which there is something approaching more or less affluent leisure for all. However, since a society does not provide psychologically necessary challenge and adversity, these elements will have to be provided through rigorous educational experience, stimulating change of occupation according to the abilities of individuals, and the provision of opportunity to make socially valued contributions throughout life.

The family, in a variety of traditional and non-traditional forms, will be more important than ever with women finding more of their outlets in family activities (as in the past) rather than through competition for increasingly scarce jobs outside the family. The number and importance of communes or other nontraditional forms of social and economic

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organization will increase in a future in which cultural pluralism and experimentation will have a high degree of importance.

Science and Technology

There will be great advances in agricultural science and technology allowing the world--even with a regrettably great increase in population--to feed itself. On the other hand, Gabor sees little potential for fusion energy technologies, although nuclear reactors will be available to provide cheap, low cost power. In any case, the environmental side effects of new industrial technologies will limit the application of nuclear power for increased growth.

Energy and Resources

Although nuclear reactors will provide ample power in the future, there will be limiting shortages of raw materials.

The Environment

Environmental considerations pose insuperable restraints on the ability of the lesser developed countries to industrialize to anything like the level of the developed countries. Within the industrial countries, Gabor sees environmental pollution as a real and increasing hazard. However, the developed countries will be more and more willing to submit to regulation by government agencies in the interest of preserving the environment.

Population/Demographics

There is no possibility of halting population growth in the industrialized countries before the early decades of the next century, and growth in the rest of the world will continue for a further 50 years, at least, not stopping until world population reaches about 8 billion.

There is a possibility of Malthusian catastrophes intervening, however. If necessary, governing bodies will develop programs of mass sterilization or other techniques to halt population growth in the interest of the survival of human societies as humane organizations. The recommended means is the "lacing" of food with sterilizing agents.

Food and Agriculture

The Green Revolution and related food technology will probably be sufficient to the task of providing food, assuming that population growth rates are slowed. However, there will increasingly be shortages of fertilizer. The possibility of severe food shortages and famine in the lesser developed countries is relatively high.

REVIEW OF FUTURES LITERATURE

#7

Source: Meadows, D.H., et al., The Limits to Growth (Potomac Associates Book, Signet, New York, 1972).

Time Frame: 1970-2000/2100

Underlying Assumptions

- The earth is a finite ecosystem.
- If the present growth trends in world population, industrialization pollution, food production and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next 100 years.
- It is possible to alter these growth trends and to establish a condition of ecological and equitable economic stability that is sustained far into the future.
- The MIT world model is the most useful model now available for dealing with dynamically interacting global problems far out on the space-time graph.

Critical Issues

- Whether society will be able to save itself by limiting accelerating growth in population, pollution, resource depletion, industrialization, and malnutrition.
- Whether sufficient incentives will exist to encourage a global shift to an equilibrium society.
- The nature of desired growth in the equilibrium society.

Key Events

Given continued growth:

- The collision of growth with the finite physical limits of the global ecosystem.
- The collapse of the world system as we know it.

Given the achievement of an equilibrium society:

- The capital plant and the population constant in size.
- All input and output rates--births, deaths, investment, and depreciation--kept to a minimum.
- The levels of capital and population and the ratio of the two set in accordance with the values of the society.
- No global system collapse.

World Economy

> Population cannot grow without food, food production is increased by growth of capital, more capital requires more resources, discarded resources become pollution, pollution interferes with the growth of both population and food. (p. 97)

It is the interdependence of the world economic system that encourages a complex world problem-spiral. Because the exponential rate of increasing population and resource depletion cannot be accomodated by the physical limits of the planet, the rate of world system growth will have to be slowed to the point of equilibrium. MIT's computer model of the world system points out the need for zero population growth, and the desirability of a constant or declining rate of world consumption of food, energy, and resources.

To avoid reaching the absolute limits to the growth spiral, the world economic system endeavors to maintain average industrial output at about the 1975 level. Excess industrial capability is employed for producing consumer goods rather than increasing the industrial capital formation rate above the depreciation rate. Policy measures are adopted to assure the attainment of equilibrium levels of population and resource consumption.

Capital is diverted to services, food production, and pollution control, leading to a low final level of industrial capital stock. To counteract this "capital drain," the average lifetime of industrial capital is increased, encouraging the manufacture of durable goods, thereby slowing the depletion of reducing resources.

U.S. Economy

> ...the process of economic growth, as it is occurring today, is inexorably widening the absolute gap between the rich and the poor nations of the world. (p. 50)

The Limits to Growth is intended to demonstrate the interaction between global demographic growth and global economic growth. There is thus no specific mention of U.S. economics and the subject is considered implicitly only to the degree that the United States, as the world's most economically developed country, must assume leadership in the effort to achieve global economic equilibrium with an equitable distribution of wealth. It will be the role of the developed countries to decelerate the growth of their own material output, while assisting the developing nations in their efforts to advance their economies more rapidly.

U.S. Politics

In the global context of the book, no specific mention is made of the U.S. political future. In the general sense, however, it is noted that the rate of political change will be insufficient to cope with faster-changing problems occurring within the dynamic system.

Foreign Relations

> We have no doubt that if mankind is to embark on a new course, concerted international measures and joint long-term planning will be necessary on a scale and scope without precedent. (p. 197)

The selfish intents of the sovereign nation-state will only exacerbate the tendency toward continued growth and development.

The problem of achieving a global concensus to limit growth is not specifically mentioned, but given the desirability of such a goal, it will be the role of the developed nations to use their high plateaus of development as staging areas from which to organize more equitable distribution of wealth and income worldwide.

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Society and Culture

> Since we find it difficult to imagine what new forms of human social behavior might emerge and how quickly they would emerge under collapse conditions, we have not attempted to model such social changes. (p. 149)

Despite the model's material orientation, the conclusions of the study point to the need for fundamental changes in social values and goals at the individual, national, and world levels. The most obvious implication is the need for social and cultural institutions to acquire new flexibility in their adaption to change and the rate of change.

Science and Technology

> ...many of the technological developments mentioned here--recycling, pollution control devices, contraceptives--will be absolutely vital to the future of human society if they are combined with deliberate checks on growth. We would deplore an unreasoned rejection of the benefits of technology just as strongly as we would argue here against an unreasoned acceptance of them. (p. 160)

Technology will be able to relieve the symptoms of many major problems, yet it will be unable to affect the underlying causes of those problems. Thus, the application of technology to apparent problems of resource depletion or pollution or food shortage has no impact on the essential problem, which is exponential growth in a finite and complex system. Owing to the cause-effect delays in a system undergoing rapid change, new policies and actions must be adopted long before the results of old policies and actions can be assessed. Thus, population and capital, driven by exponential growth, not only reach their limits but temporarily shoot beyond them before the rest of the system, with its inherent delays, reacts to stop growth. Using the most optimistic estimates of the benefits of technology in the world system model, Meadows, et al., believe that the decline of population and industry cannot be postponed beyond the year 2100. In the shorter term, society is plagued by problems with no technical solutions. The side effects of various technologies on the world's physical and economic systems are disruptive, and the social side effects are painful because of an insufficiently rapid rate of political, ethical, and cultural change.

If growth can be slowed by moderating population increase and capital accumulation, technological advance would be both necessary and welcome in the resultant equilibrium state. With the incentive of improving quality of life, technology could be directed toward such practical discoveries as waste collection and recycling, designing for product durability, solar energy development, natural pest control, and medicine and contraception.

Energy and Resources

> ...as long as...population and industrial growth continue to generate more people and a higher resource demand per capita, the system is being pushed toward its limit--the depletion of the earth's nonrenewable resources.(p. 76)

The development of controlled nuclear fission and other new energy technologies might eventually assure abundant energy, but the economic impetus that such resource availability would provide must be accompanied by curbs on pollution if a collapse of the world system is to be avoided.

The equilibrium state necessary to avoid such a system collapse would be characterized by a reduction in resource consumption to one-fourth its 1970 rate. This reduction is due in part to a shift away from preferences for factory-produced energy-intensive material goods and capital redistribution, to resource recycling and other energy-frugal technologies.

The Environment

> We do not know the precise upper limit of the earth's ability to absorb any single kind of pollution, much less its ability to absorb the combination of all kinds of pollution. We do know however that there is an upper limit. (p. 92)

Virtually every pollutant that has been measured as a function of time appears to be increasing exponentially, at a rate even greater than population increases. Yet since pollution generation is a complicated function of population, industrialization, and specific technological developments, it is difficult to estimate exactly how fast that exponential curve is rising. Because natural delays in ecological processes increase the probability of underestimating the control measures necessary, the likelihood of inadvertantly reaching the upper limit of pollution is increased. Reaching this upper limit would mean the certain collapse of the world system as it now exists.

To avoid this system collapse, it is necessary to impose deliberate constraints on the growth of both capital and population in order to achieve an eqilibrium state. In such an equilibrium state, pollution would decrease as the economic preferences of society are shifted more toward services, such as education and health, and less toward factory-produced material goods. Technological development and determined control policies could reduce pollution-generation per unit of industrial and agricultural output to one-fourth of its 1970 value.

Population/Demographics

World population in 1970 totaled 3.6 billion, and the rate of growth was 2.1 percent annually--a doubling time of 33 years. Population has been growing exponentially, but the rate of growth has also been growing, such that population growth has been "super-exponential." World life expectancy is 53 years and still rising; improved medical care and agricultural techniques have contributed to a still declining mortality rate. At the present rate, world population will reach 7 billion within 30 years. And if the mortality rate continues to drop, with no lowering of the fertility rate, the population will increase fourfold in 60 years.

To achieve equilibrium in the world system, it is necessary not only to stabilize industrial capital stock, but to stop population growth as well. To bring about population stability, two basic policies are introduced:

(1) the population has access to 100% effective birth control, and (2) the average desired family size is two children. If these policies are adopted in 1975, stability does not occur until midway through the 21st century, when the birth rate exactly equals the death rate.

Food and Agriculture

> ...even with the optimistic assumption that all possible land is utilized, there will still be a desperate land shortage before the year 2000 if per capita land requirements and population growth rates remain as they are today.(p. 59-60)

Only half of the world's arable land is now under cultivation, yet the cultivation of new land would require such immense capital inputs as to be "economically infeasible." Even if vast improvements in productivity were made through advances in agricultural technology and capital investments, the crisis point at which available land and water prove inadequate to feed an exponentially increasing population would only be delayed and not avoided. Even before this crisis point, though, many will starve because of high food prices, and others will be forced to shift to lower quality diets.

A limited growth equilibrium society would be necessary to avoid this crisis point. Such a society would be characterized by a stabilization in the growth of both population and capital, even if such an investment were considered "uneconomic." Also, the investment pattern of agricultural capital would be altered to make soil enrichment and preservation a high priority. If such an equilibrium society were to be attained, there would be sufficient supplies of food to assure a high quality diet for the global population.

REVIEW OF FUTURES LITERATURE

#8

Source: Pirages, D.C. and Ehrlich, P.R., Ark II--Social Response to Environmental Imperatives (W. H. Freeman & Co., San Francisco, 1974).

Time Frame: Next 25 to 50 years

Underlying Assumptions

- The world is in the middle of a "Tragedy of the Commons" in which the participating nations are competing for their share of a finite resource base while ignoring the contaminations and impending collapse of the entire ecosystem.
- This Tragedy of the Commons has its roots in the dominant social paradigm (DSP) of the industrial world. Because the industrial paradigm is insufficient to solve the problems, nothing less than a shift in the DSP can avoid the inevitable collapse.
- The shift in the DSP must begin with the individual because social and political institutions are a function of the DSP and not designed to facilitate the change.
- Overpopulation is the single most influential factor in the Tragedy of the Commons because of its massive impact on resource consumption and environmental pollution.
- Increased government intervention and regulation is implied in all proposed solutions.

Critical Issues

- Overpopulation.
- Finite resources.
- Environmental deterioration.

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Key Events

- The emergence of a new dominant social paradigm.
- Establishment of a Planning Branch within the Federal government.
- Establishment (rejuvenation) of a world regulatory body.

World Economy/Foreign Relations

The authors view international relations and international economics as one. U.S. foreign policy is determined by the economic needs of the old expansionist economic paradigm. Relations are established and maintained with countries for the resources they can supply and the markets they have to offer for finished products.

Because the less developed countries cannot follow the path of the over-developed countries, new types of aid and development must be found. As no institution now exists which can accomplish this, the United States must begin to make the following changes in its own self-interest:

1. Readjustments in its consumption pattern.
2. Transfer of potential future wealth to the less developed countries.
3. Encouragement of consensus rather than the use of economic blackmail in international concerns.

U.S. Economy

The "cowboy" economy of the industrial paradigm assumes unlimited resources and opportunities which no longer exist. A new paradigm is needed which emphasizes a shift from consumption to conservation along with a redefinition of the "planned" (public) and "free" (private) segments of the economy.

The resulting new steady-state economy assumes a constant population, a lower level of material expectation among the people, and constant throughput over time.

U.S. Politics

The present political system is inadequate to cope with today's problems. The method of electing representatives, the competence of the representatives, and the goals of the system all need to be changed.

Pirages and Ehrlich recommend establishing a Planning Branch of the Federal government which would be responsible for the formation and regulation of 5, 10, and 50 year plans, and which would recommend legislation to implement new "microconstraints"--governmental regulation concentrated at critical pressure points closer to the source and farther from the individual.

Society and Culture

The dynamics of every society are governed by its dominant social paradigm (DSP). In the United States this is best characterized as the industrial paradigm, which views consumption and growth as necessary and good.

This existing industrial paradigm has forced individuals to relate to one another as competitive economic entities. It maintains a myth of equal opportunity while relying on unequal distribution of wealth.

In the new society people must recognize the dignity of the inner person and the potential of each human being. The transformation must begin with the individual and at the level of the nuclear family by varying the family structure that now tends to support the isolated, competitive view.

Science and Technology

There is a need for a more rationally controlled material technology and a new social technology which encourages and rewards ecologically sound behavior.

Science can no longer be viewed as apart from society, but rather must be considered as an integral part of it, with a responsibility to that society for what it produces. This transformation to a responsible science should take place through engaging more scientists in politics and using the leverage of political institutions to educate people about the scientific community.

Energy and Resources

Three conclusions regarding resources are:

1. The most serious limitations to the continued use of nonrenewable resources are economic and environmental.
2. Various substitutions will not solve all resource problems.
3. Rate of change problems and many temporary shortages and dislocations rather than absolute depletion will dominate the resource picture.

Given that a problem exists with regard to limited resources, Pirages and Ehrlich cite two feasible alternatives to solving it:

1. Invest in new R&D in the hopes of finding innovations that will take you around the problem.
2. Use social policy to hold down rising expectations while using technology to find new ways to reduce consumption.

The Environment

The ultimate environmental crises is thermal pollution. Because it is a consequence of the second law of thermodynamics, no amount of technological gimmickry can overcome this natural constraint.

Population/Demographics

Overpopulation is the most critical issue facing mankind. It is the prime mover in resource depletion and environmental deterioration, and until it can be stabilized on a worldwide basis, we cannot begin to make progress with the problems facing mankind but can only strive to keep things from getting worse.

Food and Agriculture

> If all the food in the world were equally distributed and each human received identical quantities, we would all be malnourished. (p. 19).

The authors use the above quotation of George Borgstrom to emphasize their point that a primary constraint to population growth is the availability of food--in particular, the availability of protein, which is expensive both ecologically and economically, and for which no simple way exists to greatly increase the supply.

The possibility of raising the nutrition level throughout the world is nonexistant so long as population continues to grow. It will take all our effort and technological innovations just to keep up with the present growth rate.

While the two "salvations" of the food crises--the Green Revolution and the Oceans--are seen as less than that by the authors, the world must nevertheless rely on them until population growth stabilizes and ecologically sound food technologies are developed.

REVIEW OF FUTURES LITERATURE

#9

Source: Mesarovic, M. and Pestel, E., Mankind at the Turning Point--The Second Report to the Club of Rome (E. P. Dutton & CO., New York, 1974).

Time Frame: 1975-2025

Underlying Assumptions

- There are two types of growth--undifferentiated (replication of individual parts according to no particular plan) and organic or growth with differentiation (specialization and functional interdependence of the parts of an organic system).

- It is the historic pattern of unbalanced and undifferentiated growth which is at the heart of today's crises.

- The emerging world system is highly complex and interdependent; all issues must be considered in a global context and from multidisciplinary aspects.

- Mankind is at the turning point: we must now choose to continue with the inevitable destruction inherent in undifferentiated growth or to make the transition to organic growth which offers the possibility of the creation of a new mankind.

Critical Issues

- The current crises facing mankind are not temporary, but rather reflect a persistent trend inherent in the historical pattern of development.

- Any delays in solving these crises are devastating.

- The solution of these crises can be developed only in a global context.

- The solutions cannot be achieved by traditional means.

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- It is possible to resolve these crises through cooperation rather than confrontation.

World Economy

In their model the authors have divided the world system into ten distinct but interconnecting regions. This regionalization is based on shared tradition, history, lifestyles, stage of economic development, sociopolitical arrangements, and commonality of problems.

There is a widening economic gap between the already industrialized nations (the developed regions) and those in the process of industrialization (the developing and underdeveloped regions). This gap is expressed as the ratio of average per capita incomes between the two classifications. Setting an acceptable target ratio of 5:1 (3:1 in the more advanced of the underdeveloped regions) the authors analyze the effect of alternative foreign policies. Their results show that the only policy which meets the target ratio is one of the increased aid accumulating to $2,500 billion for the next 25 years. Thereafter the receiving nations will be self-sufficient and able to meet the target ratio by the year 2025.

Implicit in this scenario is the assumption that the foreign aid given will be in the form of "intermediate technology" and that the social and political institutions of the receiving nations are responsive to the challenge.

Foreign Relations

> In the long run, when all important factors are accounted for and the long-range benefits considered, cooperation is the only sensible and the most beneficial path for all participants. (p. 97)

The relationships between the various parts of the emerging world system are based on competition for resources--materials, energy, food, land, water, and air. If these resources were unlimited, there would be a chance to avoid conflict. The resources, however, are not unlimited.

Therefore, the question is not will there be conflict, but how will that conflict be resolved.

The choice between the two obvious alternatives of confrontation and cooperation is greatly influenced by the degree of dislocation in the normal operation of the system. In a less severe conflict in which the dislocation is entirely in economic terms, a solution can be obtained by means of the pricing mechanism. In more intense conflicts, there is a need for a more comprehensive attack. As the crisis moves up the scale of severity of conflict, the need for cooperation over confrontation becomes a prerequisite for survival of all concerned.

Society and Culture

The concept of an organic world system does not imply a uniformity of the various parts, but rather, a diversity and specialization of the elements. To this end, a clarification and strengthening of the social and cultural differences between regions is viewed as essential.

Science and Technology

A technological fix might very well become a Faustian bargain. (p. 135)

While technology may appear to have the solutions to many of the crises confronting the world system, Mesarovic and Pestel warn of the danger of short term, isolated "fixes." The solutions must be long term and governed by anticipatory thinking, because the sheer size and complexity of the technological edifice will not allow easy dismantling or quick change should a solution prove inadequate.

Technological solutions must not be isolated but rather considered in terms of the supporting network required to service them.

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Energy and Resources

The crises over the availability of resources can take on two dimensions--the short term versus long term trade-off, and the user versus supplier confrontation. With respect to the former, it is explicit throughout the book that short term solutions are no solutions at all. The only successful attack on today's crises will necessarily have to take a long range view.

The user/supplier confrontation, while offering more possible combinations of approaches, likewise has only one approach that will prove successful. This is a spirit of "qualified cooperation," that is, each side attempts to take decisive advantage of the weakness of the other but without forcing a collapse of the system.

In one such "cooperation" scenario, the long term solution requires that the oil exporters raise prices to an optimal level but refrain from placing production ceilings, and simultaneously reinvest petrodollars in the developed world. The oil importers, meanwhile, raise the prices of their exported goods only in response to normal economic forces and they do not embark on a crash program of energy self-sufficiency.

The authors advocate a comprehensive three-stage energy policy. The short range strategy requires an adequate supply of oil be available to maintain stability in the world system in exchange for a guaranteed permanent role for oil exporters in the long term energy scheme. The intermediate strategy would supplement primary energy sources with coal, gas, and liquified coal. The long term strategy would be based on solar energy.

Population/Demographics

In keeping with the prophylactic nature of the book, no predictions are made concerning the world's population in the year 2025. However, various outcomes are projected using alternative population policy scenarios, and from these emerge the two critical points stressed by the authors: (1) the available solutions to the population crisis are not increasing with time, and (2) to postpone implementing an effective population policy can only result in increased human suffering and death.

Food and Agriculture

Using protein content of food as a unit of measure, the world system model is run with varying scenarios regarding food and population policy. Of the many combinations attempted, only one was successful in averting unprecedented disaster in terms of mass malnutrition and starvation. This one feasible solution to the food crisis is characterized by:

1. A global approach to the problem.
2. Investment aid rather than commodity aid (except for food).
3. A balanced economic development for all regions (an industrial base as well as an agricultural base is necessary in all regions).
4. An effective population policy (equilibrium fertility rate--zero population growth--as soon as possible.
5. Worldwide diversification of industry leading to a global economic system (maximum effective use of available labor, capital, and resources).
6. Adjustment in the eating habits of the affluent peoples of the world.

REVIEW OF FUTURES LITERATURE

#10

Source: Heilbroner, R. L., An Inquiry into the Human Prospect (W. W. Norton & Co., New York, 1974).

Time Frame: Next decade to next century.

Underlying Assumptions

- There are very real physical limits to continued industrial growth (e.g., heating of the atmosphere).
- We are rapidly approaching the limits to population growth, both politically and physically.
- Capitalist economies will not be viable either in the short run or long run.
- Socialist economies will better be able to respond to the short run crises, but unable to sustain that in the long run.
- Our political systems (e.g., democracy) are incapable of adapting quickly enough.
- People will be unable to voluntarily restrain their desire for greater material wealth.

Critical Issues

- Extending our value perspective to include several future generations.
- Halting industrial growth while devising a new means of income distribution.
- Preventing nuclear terrorism.
- Controlling population growth by positive means (as opposed to catastrophe).

Key Events

- The development of state capitalism
- Rise of revolutionary socialist regimes
- Effective end of democracy in the United States
- Wars of redistribution
- Nuclear terrorism.

World Economy

> Can we expect an industrial socialist society, be it characterized by authoritarian or by democratic government, to weather such a transformation more easily than a capitalist society, "private" or state? I doubt it. Both socio-economic systems are committed to a civilization whose most striking aspect is its productive virtuosity. But much skepticism is based on more than the resistances and inertias of vested interests that we find throughout history when established modes of production become obsolete. It is also founded on a political consideration, namely, whether *any* society can bring about alterations of this magnitude through the conscious intervention of men, rather than by convulsive changes forced upon men. (p. 94).

The future for the other capitalist nations of the industrial world is essentially the same as for the United States. The socialist nations, Heilbroner suggests, will fare better in the short run because of their ability to control and manage their economies: they do not face the pull of commercial considerations. In the long run--say into the next century--they too will founder on the income distribution problem. As even the theoretically equal shares shrink, people's shattered hopes of material progress will not permit a well-ordered socialist economy to be maintained.

U.S. Economy

> I am inclined to the belief, therefore, that the problem of income distribution will pose extreme difficulties for capitalism of a political as well as an economic kind. The struggle for relative position would not only pit one class against another, but also each against all, as lower and middle groups engaged in a free-for-all for higher incomes. This would bring enormous inflationary pressures of the kind that capitalism is already beginning to experience, and would require the imposition of much stronger control measures than any that capitalism has yet succeeded in introducing--indeed, than any that capitalist governments have yet imagined. (p. 88).

Fundamental to Heilbroner's scenario is his assumption that either by choice or by force, U.S. material production will have to level off or even decline in the near future. This inevitable end to the growth economy has three major consequences. First capitalism is founded on the continuing drive for "more," but by stabilizing market shares through state capitalism, this imperative could be checked. Second, capitalism relies on expansion to avoid economic crises leading to falling incomes and employment: the managed capitalism would include major government spending for public goods (e.g., housing, transit) transfer payments, and perhaps the distribution of "surplus" goods to the less developed countries.

The final consequence stems from capitalism's reliance on growth to deal with the poor: if everybody's absolute share goes up we do not have to worry too much about inequities in distribution. By contrast, a stationary economy has no such remedy and founders on the distribution of income.

Thus the picture is one of an emergent state capitalism moving to socialism to respond to the income distribution dilemma. Socialism, however, can only briefly respond as everyone's shares shrink with rising population, leading finally sometime in the next century to complete collapse.

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U.S. Politics

> For the majority of capitalist nations, however, I do not see how one can avoid the conclusion that the required transformation will be likely to exceed the capabilities of representative democracy. The disappointing failures of capitalist societies to create atmospheres of social harmony, even in expansive setting, does not bode well for their ability to foster far-reaching reorganizations of their economic structures and painful diminutions of privilege for their more prosperous citizens. The likelihood that there are obdurate limits to the reformist reach of democratic institutions within the class-bound body of capitalist society leads us to expect that the governments of these societies, faced with extreme internal strife or with potentially disastrous social polarization, would resort to authoritarian measures. (p. 90).

> One cannot have political power without political obedience; one cannot have strong government without a sense of national identification. (p. 102).

Heilbroner foresees a transition into a strongly authoritarian nationalistic state in this country, as well as others. He argues that the historical attempts of democracies to cope with ills in a democratic fashion do not auger well for their capacity to resolve the impending dilemmas and remain democratic. He bases this argument on two qualities of "human nature" which he attributes to Freud. Since the child, in his very early life, is totally dependent on adults (authority figures) for its security, he becomes conditioned to seek a subordinant/superordinant relationship when as an adult his security is threatened. Thus we see the calls for strong leadership and the cult of personality. The second quality is the development of a child's capacity for identification with others, i.e., a sense of belongingness. Heilbroner argues that the limits of identification are the nation-state and in a temporal sense the next generation, i.e., one's own children. Thus he suggests that the nation-state will continue to persist irrespective of the challenges of interdependence. He does, however, allow that it may be possible to extend temporal identification to more than one generation in the future.

Foreign Relations

> It must be evident that competition for resources may also lead to aggression in the other, "normal" direction--that is, aggression by the rich nations against the poor. Yet two considerations give a new credibility to nuclear terrorism: nuclear weaponry for the first time makes such action possible; and "wars of redistribution" may be the only way by which the poor nations can hope to remedy their condition. (p. 43)

The United States will find itself increasingly in a defensive posture unless, of course, it chooses an overtly imperialistic posture of seizing the resources it needs. Fortress America will emerge as the United States becomes threatened by revolutionary socialism all over the globe. Moreover, these new regimes will likely possess the capacity for nuclear blackmail either by bluff or in fact. With little to lose, "wars of redistribution" led by these nations may become commonplace, or at least the continuing threat of such wars will force the walling off of America even from its recent allies of Western Europe and Japan who will also be forced into competition for scarce resources and be similarly threatened.

Society and Culture

> It is therefore possible that a post-industrial society would also turn in the direction of many pre-industrial societies--toward the exploration of inner states of experience rather than the outer world of fact and material accomplishment. Tradition and ritual, the pillars of life in virtually all societies other than those of an industrial character, would probably once again assert their ancient claims as the guide to and solace for life. The struggle for individual achievement, especially for material ends, is likely to give way to the acceptance of communally organized and ordained roles...This is by no means an effort to portray a future utopia. On the contrary, many of these possible attributes of a post-industrial society are deeply repugnant to my twentieth-century temper as well as incompatible with my most treasured privileges. The search for scientific knowledge, the delight in intellectual heresy, the freedom to order one's life as one pleases, are not likely to be easily contained within the tradition-oriented, static society I

> have depicted. To a very great degree, the public must take precedence over the private--an aim to which it is easy to give lip service in the abstract but difficult for someone used to the pleasures of political, social, and intellectual freedom to accept in fact. (pp. 140-141)

Heilbroner does not offer much in the way of a prognosis for the sociocultural environment for the future. However, he does describe several developments. With the end of affluence will come a more rigid and inwardly directed social order, not from seeking after greater spiritual growth but rather from the closing off of other domains. Most painful to him personally will be the end of the "luxury" of the intellectual life. In the austere and insecure life of the future the freedom of heresy and dissent will not be tolerated. The greater needs for unity of purpose will not allow the intellectual freedom of present-day U.S. society to persist.

Science and Technology

> ...I must identify a fundamental element in the external situation--not so much a fourth independent threat as an unmentioned challenge that lies behind and within all of the particular dangers we have singled out for examination. This is the presence of science and technology as the driving forces of our age. (p. 56)

Science and technology have given man immense power. However, our ability to control that power has not developed apace. Thus the three imminent challenges of population, nuclear war, and the environment all have their roots in science and technology. (The rapid rise in population is due primarily to advances in health and medicine resulting in a falling death rate.) Further, people have not been made happier or more content by the advance of science and technology. Heilbroner attributes this to the inevitability of a rigid industrial system arising from the scientific imperative. Thus he foresees severe restrictions on science and especially technology in the authoritarian stationary economy.

Energy and Resources

> ...reserves of all known elements exist in "limitless" quantities as trace elements in granite or sea water, so that, given the appropriate technology and the availability of sufficient energy, no insurmountable barrier to growth need arise from resource exhaustion for millennia to come. (p. 48)

In the long run the actual availability of energy and other resources will not be a problem. However, the environmental effects, particularly climatic changes, induced by the production and consumption of the energy and extraction of the resources place an upper limit on industrial growth. In the short run the temporary shortages will only exacerbate the deteriorating political situation and may even lead to wars in some instances.

The Environment

> ...ultimately there is an absolute limit to the ability of the earth to support or tolerate the process of industrial activity, and there is reason to believe that we are now moving toward that limit very rapidly. (p. 47)

> Every sign, however, points in the same direction: industrial growth must surely slacken and likely come to a halt, in all probability long before the climatic danger zone is reached. (p. 55)

The climatic effects of the heat dumped into the atmosphere by the production and consumption of nonsolar energy is the ultimate environmental limit. Almost all the energy we consume--and consume at a growing rate--winds up as heat. This heat modifies the climate in such a way as to make it nonviable for the current biological organisms inhabiting the biosphere. Thus, even if all other environmental problems (e.g., solid waste pollution) can be solved by technology, this limit will force an ultimate cessation to the continued growth of industrial civilization. (One remedy--conversion to solar energy as the sole energy source--is conceivable but not likely.) The ultimate limit may not actually be reached for over a century or more; however, we will feel--and perhaps already are feeling--its effects much sooner.

Population/Demographics

> The cesspool of Calcutta thus becomes more and more the image of urban degradation toward which the dynamics of population growth are pushing the poorest lands. (p. 37)

> ...the population problem brings as an immediate consequence an aggravated risk of aggressive behavior on the part of the threatened capitalist world. (p. 80)

Population growth is seen by Heilbroner as one of the three major threats to mankind. Because of the age distribution within the population, even if a "successful" global-scale birth control program were mounted today, the population--especially of the less developed countries--would more than double in a century. However, there appears to be no prospect that population control will be voluntarily accepted in the near future. Thus the population will continue to grow in the poor world much faster than in the rich world, only exacerbating the gap between them.

The first consequence of this growth will be starvation on a massive scale, which we are already beginning to witness. Second, as the hungry masses stream from the countryside into urban centers, there will come a collapse or near collapse of those centers. The response to this will be the continued rise of authoritarian regimes all over the third world. The main aim of these regimes will be simply survival; hence, it is likely that they will attempt to install some form of communist economy. This trend will bring with it a rise in world tension as the capitalist nations feel threatened and opportunities for clashes among neighbors increase.

Food and Agriculture

Though it is not likely--primarily because of problems with water, fertilizer, and most of all organization--modern agriculture may yet rescue the hungry masses in the short run. More likely in the short run is that starvation will be the most effective means of population control. Certainly in the long run agriculture cannot keep up with a constantly doubling population. Heilbroner does not maintain the desirability of this Malthusian check, just that it is inevitable. It is also very likely that the rise of revolutionary socialism will be fueled by the need to restructure agriculture.

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REVIEW OF FUTURES LITERATURE

#11

Source: Wylie, P., The End of the Dream (Daw Books, Inc., New York, 1972).

Time Frame: 1975-2000

Underlying Assumptions

- Existing social institutions are incapable of sufficiently rapid adjustment to change.
- Continued technological growth, without adequate scientific management, is incompatible with the survival of ecosystems.
- Public addiction to the material-consumption ethic is profound and firmly entrenched.
- The public is detached from the systems and institutions that govern society.
- Technology cannot always provide the solutions to technologically-induced social problems.
- The natural environment is a balanced system; interference can result in unpredictable and destructive states of imbalance.

Critical Issues

- Maintenance of progress, growth, and industrial production.
- Compatibility of technology and environmental preservation.
- Appropriateness of existing social/political systems to deal with environmental threats.
- Likely capacity for global cooperation.
- Management of science and technology

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Key Events

- Black Valentine's Day:

  A massive power failure in New York City caused by a single man's deliberate act of sabotage and resulting in more than one million deaths.

- Blue Haze Blight:

  Extensive crop failure and livestock deaths resulting from the unsafe disposal of toxic industrial chemical waste.

- Brownsville African Bee Infestation:

  Infestation of a mutant form of a Brazilian killer bee, brought about by alteration of the bees' natural habitat.

- Master Mixfrozen Foods:

  Human deaths resulting from the consumption of a specialty processed food.

- Peterkinsis "Green Slime" Algae:

  Uncontrollable spread of stream-killing algae brought on by chemical alteration of the algae strain.

- Cleveland's Cuyahoga River Explosion:

  Widespread death and destruction resulting from the massive explosion of the Cuyahoga River which had been saturated with highly flammable pollutants.

- Slaughter Saturday:

  Unusually heavy and toxic air pollution combined with an extreme temperature inversion which caused the death of over one million New York City inhabitants; the crisis sparked looting, violence and civil disorder.

- Little Dwain River Boil:

  The disposal of waste heat from a nuclear generating plant into the Dwain River, resulting in loss of human life and the death of the river.

- The Sexual Redemption:

  General acceptance of sexual liberation--free love, sex education in schools, pornography, recognition of homosexuality and demise of sex laws.

- The First World Cataclysm--The Black Blight (Rice Blast):

  Destruction of the world's rice crop caused by chemical interference in the ecosystem.

- The Second World Cataclysm--The Vibes:

  Man-eating sea leeches, causing worldwide loss of life in the hundreds of millions; the population explosion of the vibes was brought about by man's sea pollutants which killed control predators.

- Polar Ice Melt:

  Resource recovery at the poles and its accompanying atmospheric pollution brought about a shift in world weather/temperature patterns and a massive rise in sea level.

World Economy

Despite some indications of world cooperation and the apparent recognition of the implicit economic laws of "spaceship Earth," the future distribution of goods and services is still dependent upon the selfish motivations of individual nation-states.

Without elaborating on specific examples of international trade or monetary policy, Wylie simply sets the stage for the exploration of his theme: the economic system and other systems and institutions of modern technological society are incapable of existing within the limits of the earth's ecosystems.

U.S. Economy

The public had not grasped the fact that its sudden interest in environmental cleanup was on a collision course with the goods and

> services or Gross National Product which it bought or used at an ever-increasing rate, one it had not the slightest intention of curtailing. (p. 29)

Wylie foresees little significant change in the basic economic structure of the United States through the year 2000. All the components of our present industrial society--corporate capitalism, military-industrial cooperation and interdependence, annual GNP growth, mass consumerism--are apparent, if not slightly exaggerated, in Wylie's future view.

The dominant economic theme is the "cost" of economic growth, both as an opportunity cost and as a trade-off against environmental degradation. Questions are raised not only about the limits to economic growth but also about society's capacity to transcend the self-limiting nature of its materialistic priorities.

Wylie's view of the economic future is broad based, giving consideration to the interdependence of social/cultural and environmental issues.

U.S. Politics

> The people in great majorities prevailed and the industries serving them stimulated their senseless choices as did their elected leaders. A technological society cannot persist as a democracy unless the people in their majority understand both technology and ecology well enough to know what they are doing. (p. 93).

Wylie views the future U.S. political system as fairly similar to the already existing political system and organizational structure. This similarity allows Wylie to specify the shortcomings of our present system. He sees the maintenance and protection of the military/industrial complex as the primary role of the U.S. political system. Exaggerated adherence to the systemic status quo is Wylie's means of emphasizing the inability of the political system to anticipate, recognize, or adapt to changes in social priorities, and thus supporting his argument.

It is clear, though, that this ineffectiveness is founded not in the political system itself, but in the social system that perpetuates the political order. The public is quick to lay blame on politicians for their failure to adequately manage the social systems of the day (in reaction to the death and devastation of "Slaughter Saturday," vigilante mobs murder many politicians), yet no public action is ever initiated to revise or replace the unresponsive political structure.

Foreign Relations

> Our long-time fear and hatred of Russia and its Reds, and China, too, has been lessened owing to worldwide contaminations that recently drove us together to seek means to end the ultimate death of the ecosphere. But the means in being are, still, not a fraction of those required and agreed on. All parties in this debate blame one another and none is willing to appropriate the essential money. (p. 150)

The recognition of shared, global problems really does little to foster international solidarity, cooperative planning, or equitable resource distribution. Despite the multitude of global threats, peoples are divided by their anachronistic concepts of national boundaries and political ideologies. East and West are still fundamentally divided, and in the Middle East there is bitter fighting and extensive loss of life.

The single instance of global solidarity--massive aid in response to the Black Blight in the world rice crop failure--collapses as a result of advanced nations' reactions to the immigration of starving aliens from the rice-dependent countries.

By the end of Wylie's scenario, massive extermination of the world's population has occurred in a sufficiently short time to shatter man's regard for his special nation and its political and economic system. Only then is the need for a central world government realized, and even then, Wylie projects, it is probably too late.

Society and Culture

> A tremendous and absolute shift in all dominating cultural concepts would be necessary for the mere hopeful beginning of environmental restoration and salvage. (p. 25)

The most significant social/cultural phenomenon that Wylie projects is addiction to consumerism. It is the public's dependence on the consumption of material goods that feeds the economic and technical fires of social and environmental degradation. Pursuit of affluence is the underlying social value and motivation.

Mass communication, mass transportation, urban concentration, and the shared consumption ethic tend to encourage the development of homogeneous public attitudes, consciousness, character, and behavior.

Ignorance about the mechanics of the economic/technical foundation of society prevents the public from perceiving the self-destructive nature of their social priorities. The affluent masses seem content in the maintenance of the systemic status quo. In fact, public faith in the system is so pervasive as to leave little margin for the adoption or even the consideration of nontechnical solutions to social problems--even when it is apparent that most of those problems are induced by the technical system itself.

Public reaction to crisis is on an immediate scale (self-preservation), and even the worst of world cataclysms does little to stimulate public concern for social reform or revolution. The only major social reform that Wylie outlines is appropriately hedonistic--the "Sexual Redemption" (see Key Events later).

In general, Wylie projects a rather pessimistic future of an ignorant, apathetic, and self-serving social/cultural order.

Science and Technology

> Science and technology are annually adding thousands of new substances and processes and artifacts to the list of our "achievements," all productive of wastes, and often of brand new types of

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waste material. (p. 78)

Wylie makes an important distinction between science and technology, praising the former and laying blame on the latter as the instrument of world destruction. Science is knowledge, and technology is the applied parts of science. The world cataclysms that Wylie describes are caused by the introduction of technology without sufficient holistic scientific planning.

There are two underlying themes of the book. The first is that science and technology are self-perpetuating, and eventually self-destructive. The advance of technology becomes sufficiently accelerated that it is beyond the capabilities of scientists to understand or control its multiplicity of impacts and implications. Wylie describes how the by-products of this advance (waste, pollution, expenditure of resources) bring about a series of interdependent and usually irreversible eco-calamaties which multiply and expand until a series of world cataclysms virtually eliminates human life.

The second theme deals with the public attitudes and values that allow this self-destructive advance. Technology creates a wealth of goods and services which foster widespread public faith in the benevolence of that technology, and an equally strong faith that any corresponding environmental degradation or ecological imbalances can be corrected through the application of sufficient money and further technology.

The scientific/technological future that Wylie projects is basically an extension of already existing technology, with no major new technologies suggested. This limited projection seems a deliberate means to emphasize the self-limiting nature of likely growth within the current social/institutional system.

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Energy and Resources

This future is characterized by general energy and resource shortages, blackouts, brownouts, and system failures. Efforts to bridge the energy and resource supply/demand gap include the widespread utilization of virtually every technically and economically feasible method of resource recovery--strip mining, oilsand recovery, enriched uranium and plutonium breeder reactors, pit-fired steam generation, and coal mining and petroleum recovery in Antarctica. The environmental impacts include the creation of soot, sulphur oxides and a variety of airborne toxins, scarred land, polar ice melt, and a multitude of effects generally labeled the "Atomic Crisis" (cancer, stillbirths, deformed babies, drop in life expectancy).

As in other sectors of society, policies for energy and resource recovery and utilization are determined by the primary social objective--growth in the technical/industrial/consumption system. Likewise, growth in energy demand continues. The victims of the various world cataclysms had used the smallest amounts of electricity so that their erasure did not greatly relieve the ever-growing demand for more and more energy. Wylie refrains from speculating about competition for recovery or about fundamental questions of energy economics and price.

The Environment

The growth objective of the technical/industrial/consumption system is relentlessly pursued at the expense of the environment. Aside from one aborted attempt to temporarily suspend industrial production in an effort to alter the devastating impact of productive techniques, any attempt to purge pollution or any claim of such activity is undeniably fraudulent.

The extremes of environmental degradation reach the point of bitter irony when the President's Council on Water and Waste Futures decides to use the nation's river systems as mass effluent conveyors. Public reaction to this type of systematic degradation is minimized by the realization that any genuine effort to halt destruction of the earth's life-support systems would put an end to "progress," "affluence," and almost everything that men considered civilized.

Wylie recognizes Spaceship Earth as a balanced natural system which will predictably react in an unpredictable manner to interference with that balance. Wylie's message is clear--man is a part of the system; he does not exist above and outside of nature.

Population/Demographics

Although Philip Wylie was probably fully aware of the projected impact of exponential population growth, he does not choose to dwell on growth itself as a key issue of concern. Instead, he describes the destruction of 90 percent of the earth's human population in a series of cataclysms that occur at least two or three generations before exponentially-increasing population would have surpassed the projected limits of the planet's life-support system.

This grim scenario projects a world population of 5 billion in 1975, reduced to half that by the turn of the millenium, and further reduced to a mere 50 million by 2023. The key demographic variable that Wylie manipulates is mortality; no specific mention is made of marriages, family size, birthrate or birth control.

The book covers only a 50-year time frame and no radically different population distribution or demographic composition is suggested or implied. A logical extension of growth and distribution includes a tendency toward greater urban concentration and the maintenance of wealth inequality both within and between nations.

Food and Agriculture

> The American public continues to consume victuals containing hundreds upon hundreds of exotic materials, none present in natural foods, and all added for exclusively commercial ends, so we are, in spite of the many federal claims of "tightening up" food and drug scrutiny, liable to some unexpected private, family, or mass surprise. (p. 98)

Wylie describes a variety of rather grim surprises relating to food and agricultural supply and technology, including the devastation of arable land and fresh water supplies, the destruction of large portions of the world's fish population, the widespread occurrence of livestock diseases, and the frequent instances of crop blight and failure. The corresponding social costs include worldwide food shortages, malnutrition, and starvation.

Most of the destruction of the world's food producing capabilities is caused by man and his technological interference with a delicate world ecosystem. The widespread discharge of industrial and agricultural chemical pollutants is the fundamental cause of the various food crises described.

A particularly bitter criticism of the processed food industry is included as a means of demonstrating industrial indifference to consumer health or well-being. Corporate social responsibility is clearly an insignificant planning priority when compared with profit maximization and the advancement of processing technology.

REVIEW OF FUTURES LITERATURE

#12

Source: Brunner, J., Stand on Zanzibar (Ballantine Books, New York, 1968).

Time Frame: to the year 2010

Underlying Assumptions

- The world will be unable to voluntarily control population growth between now and 2010.
- Urban areas with high population density will experience increasing violence owing to population pressures.
- There will be no "earth-shaking" technological advance in the time frame.
- The automobile will pollute itself out of business.
- We will be able to "muddle through" without totally destroying civilization.
- There will be no major new political/social movements.
- In general, no very significant trend breaks.
- The major force for change is the inexorable pressure brought on by more and more people.

Critical Issues

- Slowing population growth.
- Devising more equitable means of distribution within and among nations.

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Key Events

- The emergence as world powers of the resource rich developing nations.
- The end of the automobile.
- The development of effective, large-scale means for controlling human behavior.

World Economy

In the developed world generally, including the socialist nations, the situation is much the same as in the U.S. In the resource rich developing nations, revolutionary socialist regimes are the rule; they experience some real growth in their general material well-being. By contrast, the nations of the underdeveloped world have been and still are on a continual downhill slide--famines, near anarchy, rising populations, etc.

U.S. Economy

The economy seems continually on the verge of collapse. High inflation persists, unemployment continues as a problem, real personal income is slowly deteriorating as is GNP. The real growth rate has been very slightly negative for a long time. People have adapted to persistent unemployment by accepting employment contracts in all situations. One of the sources of economic erosion is the continuing shortage of resources. High military expenditures are still a feature of the economy.

U.S. Politics

While the government provides more services (e.g., national health care) there is little citizen participation or even interest in politics. Most people are concerned with just getting by day-to-day. There is a fundamental cynicism about political activity, fostered by the perpetual state of near belligerence in foreign affairs as well as rising domestic political terrorism, which leads to an apathetic acceptance.

Foreign Relations

The continual struggle for a share of the world's diminishing resource base fuels the seemingly unending battle against "communist/socialist/red menace tyranny." Minor wars, police actions, and wars of liberation are frequent. U.S. trained and manned guerrilla forces are active in a number of areas. Wars of tribal consolidation continue in Africa.

Society and Culture

The most powerful force shaping the social environment is a deep-seated and pervasive feeling of hopelessness. Things seem to be slowly crumbling, ending "with a whimper" as it were. A result is much behavior oriented to the present with little account taken of the future. Drugs are common and most are legal. Sexual permissiveness is the rule. Racism becomes only a little less evident and the status of women does not advance at all during the period. The media are government dominated and used as a tool for encouraging passive submission.

Science and Technology

The major advances come in behavioral modification and control through sophisticated media, drugs, and law enforcement. Eugenics legislation is a fact. Video phones are common for the affluent, and mass transit has replaced the automobile. The human diet is highly dependent on synthetic food and is seen as another means of behavior control.

Energy and Resources

Energy is not a serious problem--new solar, nuclear, tidal, and thermal technology is being successfully applied. Resources, however, are a very serious issue and a major source of conflict. The developed nations are heavily dependent on imports. The resource rich developing nations are exploiting their resources vigorously, but for their own development. The poorer nations sell what meager resources they have just to survive.

The Environment

There has been some success in improving the environment. The automobile was banned, but not before it was deemed necessary to enclose major cities in geodesic domes. Industrial wastes are more carefully controlled, but only as a consequence of corporate self interest.

Population/Demographics

There are over seven billion people in the world and the population is still growing. In the U.S. eugenics laws designed to eliminate all forms of congenital defects have slowed the growth rate, but the population continues to grow, particularly in the major urban areas. The consequence of this continued growth is the dramatic increase in aggressive violent behavior both at the personal and societal levels.

Food and Agriculture

The major change in the U.S. is the common usage and acceptance of synthetic foods. "Natural foods" are very expensive and an important tool in the struggle for resources. In the poorer nations malnutrition and starvation are the rule. Their population growth has far outstripped any of the limited efforts made by other countries to aid them.

REVIEW OF FUTURES LITERATURE

#13

Source: Brunner, J., The Sheep Look Up (Ballantine Books, New York, 1972).

Time Frame: To the year 2000

Underlying Assumptions

- There is continued and rapid deterioration in environmental quality.
- Economic concerns continue to outweigh environmental needs.
- Corporations continue to fight environmental improvement.
- People will only become motivated to change by catastrophe.
- Government is increasingly controlled by big business and is unable to respond quickly enough to changing conditions.
- While the rest of the developed industrial nations are not far behind, the United States leads all others in its wastefulness and destructiveness.

Critical Issues

- Recognizing the sanctity of the environment and our dependence on it.
- Slowing our rate of consumption.
- Ensuring equitable access to resources.
- Attacking ecological problems before they result in systemic collapse.

World Economy

The multinational corporations have become governments unto themselves, acting without concern for national interests. There is ever increasing tension as a result of the continuing scramble for the diminishing resource base. The corporate giants are those whose product is knowledge, information, and technology (as ITT, IBM, and Xerox today). Using their considerable power, they consciously manipulate global development for their own benefit. Food has become an important economic weapon.

U.S. Economy

The trend toward concentration of economic power continues, resulting in nearly total dominance of the large corporation in almost all aspects of American life. When there is some move toward socially responsible behavior, the demands of making a maximum profit and the fealty to the sanctity of private property negate any opportunity for significant social benefit. Even in the face of imminent disaster--eco-catastrophe and social collapse--the corporations will resist change with all of their considerable power.

U.S. Politics

The American political scene has become a morass of corruption and service to special interests. There is a general sense of contempt for government. The credibility gap has become a chasm. Dissent is only minimally tolerated--arrests of dissidents are frequent. The major political strife centers around continued ecological deterioration. Terrorism against business and government (which are seen as one) is common. The forms of the Constitution are still followed but there is a strong authoritarian undercurrent in government/business.

Foreign Relations

Following the Vietnam war, the United States continues unsuccessfully to use its military strength to intervene in internal wars of liberation. The growing struggle for limited resources and the U.S. use of food as a weapon in that struggle exacerbates world tensions. The cold war between East and West persists. The United States perceives itself to be beleagured and with few friends in a hostile world. The third world views America as imperialist and a voracious consumer of its resources.

Society and Culture

The heart of Brunner's thesis is the ability of people to adapt to an ever worsening situation without real protest. In part this is due to a self-deluding blindness to what is going on, and in part to a feeling of apathetic helplessness--a sense of being locked into the system with no power to change it. It is only as the system and the environment begin to collapse that people begin to waken to their dilemma. The sad state of society has resulted not from any dramatic change but rather from erosion over the decades. It is the very gradualness of the deterioration that has fostered adaptation rather than rebellion. By the time people begin to respond as a result of crisis, it is too late--things have gone too far. The book ends with the nation going down in chaos.

Energy and Resources

The ever growing demand for and shrinking supply of resources is a critical issue and a major source of international tension. It is also a key factor in the continued deterioration of the biosphere. Environmental quality yields to economic necessity. All resources available for development are extracted with almost no attention paid to the environmental costs.

The Environment

> The hungry sheep look up, and are not fed,
> But swoln with wind, and the rank mist they draw,
> Rot inwardly, and foul contagion spread.
> Milton: "Lycidas"

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Brunner ends *The Sheep Look Up* with this quotation from Milton. Not only will we (industrial civilization) destroy ourselves through our failure to take care of our environment, but we must be stopped from spreading our "foul contagion" to other parts of the world. If we continue on our disastrous course, then we must be shunned as pariahs.

Near the turn of the century in this land the air in the cities is unbreathable without filters and the water undrinkable. The Europeans have killed the Mediterranean. Pests have become resistant to most pesticides.

Food and Agriculture

Agribusiness is food production both on the farm and in the food manufacturing and processing plants. Food is a weapon. Increasingly large quantities of synthetic foods are entering the marketplace, particularly as exports. Because of population pressures, both domestic and foreign, anything which inhibits food yields (e.g., pesticide regulation) is seen as undesirable.

REVIEW OF FUTURES LITERATURE

#14

Source: "An Organized Look at the Future: A Systematic Approach to New Business," Vol. II of a futures study for the Weyerhaeuser Company by Pacific House Associates, Inc. (March 1972).

Time Frame: 1975-2000

Underlying Assumptions

- Societies do not operate within a grand design but rather "muddle through," facing each crisis as it comes and confronting only those which it cannot avoid.
- Significant concern for environmental and resource conservation forces a consumer/government/industry alliance directed toward conservation.
- Given a hopeful future, people will respond positively to organized stimuli.

Critical Issues

- Popular acknowledgment of the need for environmental reform.
- A renewed confidence in the ability of government to respond to the public's demands.
- The ability of the productive capacity of the nation to support the new economic and social reforms.
- The continued support of reforms by the affluent elite.

Key Events

- In a national referendum the New Bargain Movement was passed. The NBM promised--and to a degree delivered--major social and political reform.

- The Great Powers Bloc was formed--an economic alliance of European, Asian, and Eastern nations.

- The Domestic Management Center was formed and staffed by career civil servants. It absorbed many responsibilities formerly held by HUD, HEW, Interior, and Commerce departments. The mission of the DMC lies between a National Security Council for Domestic Affairs and the former Council of Economic Advisers.

- Century 21 Communities--planned urban environments--are developed.

World Economy

While the United States is preoccupied with domestic reorganization, the international trade scheme shifts with the formation of the Great Powers Bloc. In effect, the United States is forced out of the new world trade order. In response, it is turning to the poor world--in particular Central and South America--to form a new and promising economic alliance in the Western Hemisphere.

U.S. Economics

The U.S. economy is characterized by increasing government intervention and regulation, and a stagnant GNP. The dominant factor shaping the economy was undoubtedly the New Bargain Movement which called for a redistribution of wealth through income tax reform and a new emphasis on economic policy guidelines for business and industry.

The immediate results indicate the plan is partially successful. A guaranteed annual income exceeding the recognized poverty level has spurred new activity in the housing, food, and other primary goods industries. There is, however, substantial skepticism about the long term viability of the new economy in that many fear the costs of the new programs will eventually exceed the revenue generating capability of the stagnant economy.

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U.S. Politics

The two-party system remains in existence at the national level but most actual political and governmental power resides in the New Movement organization, led by affluent elites from both parties and by elite senior bureaucrats with the Federal government.

Local political leaders feel they were left out by the reorganization and resent it.

Foreign Relations

A new world order is emerging. The powers of the new order are the European Community, the Japanese-led Asian Block, and the Soviet-led Eastern Bloc. The United States has been excluded by design and because of commitment to internal problems. There is, however, a growing hope for a strong Western Hemisphere Bloc which would draw together all nations from South America to the Arctic Circle.

Society and Culture

> ...matters have substantially improved. The improvements have resulted not from some grand design but from a society responding to particular issues and crises, finding the will and the way to do what it was reluctantly agreed must be done. (p. 309)

After a period of near collapse the society has begun to coalesce as a result of the New Bargain Movement. This package of social and political reform has restored public confidence in the ability of the government and other institutions to resolve issues and cope with crises. A new sense of optimism is prevalent, and the earlier trend of withdrawal into a closed, personal space has been reversed.

Despite a general satisfaction with the way things are going, all is not well. The power elite who consented to the NBM remain skeptical of its success in the long term, and not everyone is satisfied with the results of the redistribution of wealth.

Science and Technology

The United States continues to be highly dependent on sophisticated science and technology. The prevailing concern for environmental and resource conservation, however, causes a shift in the emphasis of basic and applied research. Much of the effort is now directed at developing labor intensive devices and systems that are compatible with the new standards of technological assessment.

Energy and Resources

Despite widespread concern for resource conservation, domestic petroleum and ore are in desperately short supply. While a stagnant economy helps to ease the demand pressure, a growing population poses a long range threat to the precarious balance.

The Environment

The urgent need for environmental reform was a prime factor in restoring societal momentum. Public support for reform demanded new public policy with regard to the environment and resource conservation. Gradually, as progress was made and acknowledged, a new sense of hope emerged. Both the public and its leaders came to recognize their ability to confront societal problems successfully.

Despite progressive policy and processes to conserve the environment, changing international relationships force the United States to rely more on its own diminishing resources. However, the economic stagnation and shift in technological emphasis help to maintain the hopeful outlook with regard to the environment.

Population/Demographics

Population growth is moderate and the distribution of population is regulated. U.S. government policy is aimed at establishing new nonurban

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growth centers, preserving open spaces, and converting existing cities and towns into planned communities.

REVIEW OF FUTURES LITERATURE

#15

Source: "An Organized Look at the Future: A Systemic Approach to New Business," Vol. I of a futures study for the Weyerhaeuser Company by Pacific House Associates, Inc., (March 1972).

Time Frame: 1975-2000

Underlying Assumptions

- A transformation in the value structure of the American society will come about by the mid-1980s.
- A general acceptance of "systems rationalization"--making systems more rational and responsive by correcting management's perspective--is basic to the transformation process.
- Large systems can be better managed by decentralizing control.
- Public and private interests are not necessarily conflictive and in the long run are probably the same.
- The transformation can take place within one generation and in fact is the result of a single generation of new leaders.

Critical Issues

- Acceptance of change as a normal process.
- Competition yielding to accommodation.
- A decline in materialism.
- A shift in concern for the communal good over individual interests.
- Government cooperating with private industry for the good of society.

Key Events

- A responsive and reform oriented administration takes office, backed up by a majority in both houses of Congress.
- The passing of the National Land Use Act.
- The decline of the GNP as the critical measure of the economy's well-being.
- The establishment of regional, local, and neighborhood councils.

World Economy

After a period of great divergence in the nature of its economic relations with the rich world and the poor world, the United States comes to recognize fewer differences in the two worlds. The U.S. dominance of the multinational corporations gives way to a partnership with other rich nations, and its exploitive role in poor nations greatly diminishes.

The main thrust of U.S. economic activity abroad is in high technology service systems, such as communications, weather control, systems engineering, and food and materials processing.

U.S. Economy

The changing value structure which is fundamental to this scenario has primarily affected the U.S. economy through the rejection of the old "economic growth" philosophy of management. The new "dynamically stagnant" economy is more service oriented and has adopted new measures of performance that stress quality of life rather than national product. Most people live an economically decent life with a declining interest in raising their material standard of living.

Government influence and regulation of private enterprise increased until the mid-1990s when a redefinition of that relationship brought a balance between the two sectors. This balance is maintained by new principles of management organization with minimal government intervention.

U.S. Politics

The U.S. political structure, like other aspects of the society, undergoes a dramatic transformation which culminates in a popularly accepted single party system with a changing but stable structure. While politics and government are less emphasized, the citizens participate increasingly as control passes to the neighborhood and regional councils which make decisions affecting the daily lives of the people.

Foreign Relations

The United States maintains friendly relations with both the rich world and the poor world. Abandoning its earlier role as world policeman, it assumes a more cooperative and equal position as a member of the world community. Genuine concern for the problems of the poor world is expressed in increased aid, but with fewer contingencies.

Society and Culture

The acceptance of sociocultural change is central to the scenario. This acceptance is founded in the belief that change is both necessary and good, and a process to be participated in by everyone. As a result, social and cultural differences are viewed as opportunities for new discoveries rather than threats to the existing order.

The emphasis is no longer on how to cope with change but rather how to organize in order to most effectively manage the change process. Nongovernment institutions meet this challenge by disaggregating management, thereby decentralizing into more workable components. This permits any given function to be placed at the appropriate level of control and ensures participation by all members of the organization in the processes of setting goals and evaluating progress.

Science and Technology

The role of science and technology is described by three forces: (1) the effort expended in R&D, (2) the direction of that effort, and (3) the ability to forecast the impact of new technologies. The authors see expanding investment in the R&D effort with emphasis on basic rather than applied research. A fundamental shift in the source of this increased effort also takes place with the public sector transferring much of the responsibility (via positive incentives) to private industry.

Because of the predominate interest in the physical environment, technological assessment techniques in this area develop rapidly, and by the close of the century, methods of accurately forecasting impact can be applied to all technologies.

Energy and Resources

> On the one hand, an increased commitment to environmental quality and technological assessment has reduced environmental pollution. On the other hand, the capital facilities and energy required to achieve these ends are in themselves making significant demands on our natural resources base. (p. 71)

Consistent with the emerging policy of pragmatic conservation of resources, the intent is to minimize the effects of necessary depletion while seeking ways to preserve and restore valued resources. Major efforts are being made in several areas, including alternative energy sources (thermonuclear, solar, tidal), synthetic mineral substitutes, and recyclable materials.

The Environment

The predominate attitude toward the environment can be summed as one of pragmatic conservation. A deep and genuine concern for the environment is weighed against the benefits to be derived by use of resources, and a workable balance is struck. Essential to establishing and maintaining this balance is a reduction in materials consumption and the development of new materials technology.

As a result of the government offering positive incentives to the private sector, the long standing confrontation over preventing pollution has shifted to a new sense of cooperation. The effect is a significant decline in the pollution levels of both water and air.

Population Demographics

Population growth is recognized as one of the leading determinants of the quality of life in the United States. After a period of moderate population growth accompanied by extended fertility, this century closes with slow population growth and controlled fertility.

Population distribution is also successfully regulated as the National Land Use Act (passed by the Congress in the late 1970s) encourages the planned development of new towns without permitting older urban centers to deteriorate further. As population pressure on these urban centers lessens, reconstruction begins and a new urban oriented society emerges by the year 2000.

Food and Agriculture

Few specifics are given with regard to food production; however, it is implied that the United States will continue to be a major supplier of the world's food--both natural and synthetic.

REVIEW OF FUTURES LITERATURE

#16

Source: Changing Images of Man, O. W. Markley, Project Director, Menlo Park, California: Stanford Research Institute, Policy Research Report No. 4, May 1974.

Time Frame: 1975-2000

Underlying Assumptions

- The "guiding image of man" of the industrial era is increasingly impotent and inappropriate for the conditions of modern America.
- Our contemporary institutions inhibit development of man's fullest potentials, although their form may have been appropriate for a time of relative poverty and small technological ability.
- Continued technological growth is probable, but not inherently desirable.
- The next major step in man's evolution will be the creation of social structures that will be supportive of an "ecological ethic" and a "self-realization ethic."
- Many external problems--e.g., food shortages, energy shortages, urban decay, alienation, worker dissatisfaction--are indicative of too much "success" and of the need for a new image of man-in-the-universe which can constructively cope with these problems.

Critical Issues

- How to foster the development of a new guiding image of man without manipulating people or engendering a totalitarian response.
- How to translate that new image of man into constructive social forms appropriate for post-industrial societal conditions.
- How to cope with the "limits of growth."

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- How to use our technology in a humane way.

- How to transform our science and scientific world-view.

- How to cope with seemingly incomprehensible super-systems that are increasingly important to the functioning of our society, but at the same time are so complex that they defy understanding and change.

- How to manage the change from a frontier of material growth allowed by technology to a frontier of personal/spiritual growth allowed by our relative affluence and evolutionary potential.

World Economy

Little attention is paid to international trade or economics. There is the assumption, however, that the growing gap between rich and poor nations cannot be sustained, and at some point this imbalance must be redressed. There is the further assumption that some sort of dynamic, global equilibrium or steady-state must be achieved.

U.S. Economy

The U.S. economy is expected to increasingly confront the problem of "limits to growth" and the impediments engendered by the behavioral properties of large complex systems which tend toward conditions of low performance. Another major problem is how to reach a dynamic equilibrium of steady-state economic condition while giving people sufficient affluence to live beyond subsistence--this implies income/wealth redistribution--and socially valued work roles important to a meaningful life.

U.S. Politics

The politics of complexity will likely prevail, and the majority of persons will therefore have no effective control in political decisions. With the growth of "supersystems," decisions are so complex that no one, including the expert or politician or citizen, understands the systemic character of the decision to be made (as relative political maturity declines across the board). The person can participate in decisions that are significant, but he is then submerged as one person among millions of voters; conversely, where a subsystem is small enough that the individual voice may be significant, the decision is likely to be a trivial one. Further, given the pressing problems that must be dealt with, there is likely to be an increasing deference/transference of political power to an authoritarian few in an attempt to cope successfully— thus engendering the emergence of Gross's "friendly facism."

Foreign Relations

Multinational corporations are seen increasingly as the element which binds the whole world into an interdependent economic entity. However, these corporations develop a life and power all their own as they transcend the political and economic boundaries of the nation-state. The struggle over ownership and use of worlds' resources is a primary factor affecting foreign relations.

Society and Culture

The decades to the year 2000 will be a period of enormous socio-cultural changes which, collectively, will constitute a transformation of the urban-industrial state into a more humanistic or, less hopefully, a more authoritarian society. In either case, the status quo is not expected to be extended.

Science and Technology

Science and technology are primary driving forces in the creation of the urban-industrial society, and, although they have great power, they contain no inherent direction other than their own internal dynamics. A new relationship *vis à vis* the larger society must be forged if we are to avert the growth of a bureaucratized/managed/rationalistic society of "friendly facism."

The traditional "scientific paradigm" is unduly limiting and does not allow for the development of a new image of man congruent with the future termed "evolutionary transformationalist."

Technology is not inherently bad, but it is also not the primary source of salvation for our many societal ills. Appropriate technology--that which is more conserving/simpler/frugal/approachable--will be essential, however, for building a transformed and humanistic society termed "evolutionary transformalist."

Population/Demographics

It is implicitly assumed that population growth will not present a major problem domestically--that we will tend toward a stabilized population.

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